



**METROPOLITAN
TRANSPORTATION
COMMISSION**

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Arterial Operations Committee (AOC)

10:15 A.M. – 12 P.M., Tue, Jan. 21, 2014

Conference Room 171

Metropolitan Transportation Commission

101 Eighth Street, Oakland, CA 94607

Chair: David Mahama, DKS

Vice-Chair: Saravana Suthanthira, ACTC

Staff Liaison: Vamsi Tabjulu, MTC

Linda Lee, MTC

For more information, please visit the Arterial Operations website at http://www.mtc.ca.gov/services/arterial_operations/ or contact Vamsi Tabjulu, Arterial Operations Program Manager at 510.817.5936 or vtbjulu@mtc.ca.gov

Meeting Agenda

1. Introductions (Mahama)

- Meeting Notes from Sept. 10, 2013*
- Updates from Members

2. Focused Group Discussion (Mahama)

- Adaptive Traffic Signal Control Systems – technology comparisons; infrastructure requirements; corridor/technology selection criteria; operational benefits; funding constraints and other obstacles

3. Tech Transfer Seminar (PASS) (Tabjulu)*

- Draft Outline – “Traffic Signal Asset Management - Best Practices and Strategies”

4. Program for Arterial System Synchronization (PASS) (Tabjulu)*

- PASS FY 12/13 Cycle – Draft Fact Sheets with Overall Benefits Summary
- PASS FY 13/14 Cycle – Updates
- PASS FY 14/15 Cycle – Feedback Requested for Call for Projects (CFP)

5. Featured Presentation (Leo Lee, Advantec)

- “Utilizing Innovative Technology for Lowering the Cost of Traffic Signal Synchronization Projects - A Case Study of Beach Boulevard”

6. New Business (Tabjulu)

- Presentation of Certificate of Appreciation to out-going AOC Chair – David Mahama, DKS
- Welcome our new AOC 2014 Chair – Saravana Suthanthira, ACTC
- Request for Nominations for Election of AOC 2014 Vice-chair
- AOC 2013 Annual Group Photo

*Attachment included

Next Meeting: Tue, March 11, 2014 @ 10:15 A.M.

Arterial Operations Committee
Attendees from meeting on September 10, 2013

#	Name	Agency	Phone No.	E-Mail
1	Aaron Elias	Kittelson	510.433.8077	aelias@kittelson.com
2	Amanuel Haile	Marin Co	415.499.7137	ahaile@co.marin.ca.us
3	Brian Sowers	Kimley-Horn	925.398.4862	brian.sowers@kimley-horn.com
4	David Huynh	Fremont	510.494.4484	dhuynh@ci.fremont.ca.us
5	David Mahama	DKS	510.267.6613	dcm@dksassociates.com
6	David Man	Caltrans	510.286.4607	david_man@dot.ca.gov
7	Dean Hsiao	San Leandro	510.577.3410	dhsiao@ci.san-leandro.ca.us
8	Deborah Fehr	San Ramon	925.973.2657	dfehr@sanramon.ca.gov
9	Denis Lin	W&S Solutions	925.895.6380	yiyi098@gmail.com
10	Erin Harrington	FHWA	916.498.5009	erin.harrington@dot.gov
11	Frank Penry	GHD	707.523.1010	frank.penry@ghd.com
12	Greg Groves	Safetran	719.339.2243	ggroves@econolite.com
13	Jia Hau Wu	W & S	925.413.8983	jiahau.wu@wu-song.com
14	Josh Pilachowski	DKS	510.267.6620	josh@dksassociates.com
15	Kyle Tanhueco	San Jose	408.975.3744	kyle.tanhueco@sanjoseca.gov
16	Lin Zhang	MTC	510.817.5616	lzhang@mtc.ca.gov
17	Linda Lee	MTC	510.817.5825	llee@mtc.ca.gov
18	Patrick Armijo	Advantec	562.441.1776	patrickarmijo@advantec-usa.com
19	Rawad Hani	Transpo Group	415.503.3673	rawad.hani@transpogroup.com
20	Ray Davis	Traffic Duco	510.926.2441	ray@trafficduco.com
21	Rene Baile	Menlo Park	650.330.6770	rcbaile@menlopark.org
22	Rich Shinn	Iteris	925.872.0834	rjs@iteris.com
23	Rob Sprinkle	Santa Rosa	707.543.3817	rsprinkle@srcity.org
24	Ron Hernandez	Econolite	510.207.2281	rhernandez@econolite.com
25	Saravana Suthanthira	Alameda CTC	510.208.7426	ssuthanthira@alamedactc.org
26	Shanthi Chatradhi	VTa	408.952.4224	shanthi.chatradhi@vta.org
27	Steve Fitzsimons	W-Trans	650.314.8313	sfitzsimons@w-trans.com
28	Steven Belding	MTC	510.861.5620	sbelding@mtc.ca.gov
29	Tim Sullivan	Advanced Traffic	530.908.9639	tims@advancedtraffic.com
30	Vamsi Tabjulu	MTC	510.325.3462	vtabjulu@mtc.ca.gov
31	Viet Nguyen	San Jose	408.975.3775	viet.nguyen@sanjoseca.gov
32	Walter Allen	Acumen	510.530.3029	walter.allen@acumentransit.com

Arterial Operations Committee

Notes from meeting on September 10, 2013

1. Introductions

- All members introduced themselves. The meeting notes from the July 9, 2013 meeting were approved as written.

2. Focused Group Discussion

- Members actively participated in discussing the benefits of establishing communications between traffic signals. The capabilities of wired and wireless technologies, including the latest developments and deployments in the region were discussed. Some agencies highlighted various obstacles in establishing and maintaining an effective centralized communication system, such as, lack of resources, shortage of skilled personnel, lack of ongoing technical support, and the availability of funding for operations and maintenance.

3. Program for Arterial System Synchronization (PASS)

- *PASS FY 12/13 Cycle:* Vamsi stated that several projects in this cycle have been completed and the Final Project Reports are being reviewed by stakeholders. He said that MTC will design and produce Fact Sheets for each of these projects, including an overall benefit-cost summary, which would include a brief project description, vicinity map, before and after performance charts, benefits to various modes, and benefit-cost analysis summary.
- *PASS FY 13/14 Cycle:* He said that this cycle has a total of 21 projects consisting of 543 traffic signals from six counties in the Bay Area. MTC, in partnership with Caltrans and project stakeholders, has completed the kickoff meetings for all projects and is currently reviewing the draft Scope, Schedule, and Budgets (SSBs). He said that all of these projects will be completed in accordance with the PASS guidelines and active participation and input from stakeholders.

4. Tech Transfer Seminar

- Vamsi said that the outline for the seminar on “Best Practices and Strategies to Encourage Pro-Active Arterial Asset Management” will be developed and presented for discussion at one of the future AOC meetings. A lot of members showed interested in this topic while also considering other interesting topics for the next tech transfer seminar. Also, this topic is closely related to the current efforts by MTC to establish a database of signalized intersections in the region.

5. Featured Presentation: Bay Area Signalized Intersection System (BASIS)

- Steven Belding, Arterial Ops Summer Intern, gave an update on the design and development of BASIS. He summarized the data collection efforts to date and also gave an interesting live walk through of BASIS online. He explained the need for BASIS highlighting the types of attributes that will be collected, and how they will be used to perform queries, generate reports, and produce maps for planning purposes. He said that the data from over 4,800 signalized intersections is currently included BASIS. In addition to basic location information, it has information related to the technological design and coordination status of each traffic signal. This information can be used to inform future regional transportation planning efforts, needs assessments and project performance assessments related to the Regional Transportation Plan, as well as PASS projects. He said that BASIS can serve as a signal inventory for jurisdictions that currently do not have a monitoring system or lack resources to develop/maintain a database.

6. Adjournment

- The meeting adjourned at 12 PM.



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Memorandum

TO: Arterial Operations Committee

DATE: Jan 15, 2014

FR: Vamsi Tabjulu

W. I.: 1234

RE: **Tech Transfer Seminar**

The Tech Transfer Program is an ongoing initiative under MTC's Arterial Operations Program, which supports efforts to improve the operations, safety, and management of the Bay Area's arterial network. Through this program, MTC provides seminars on a variety of topics of interest to local traffic engineers. The handouts from previous seminars are available on the tech transfer webpage at: http://mtc.ca.gov/services/arterial_operations/tech.htm

Draft Outline – “Traffic Signal Asset Management - Best Practices and Strategies”

Transportation Asset Management is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision-making based upon quality information and well-defined objectives. When applied to traffic signals, state-of-the-art asset management practices provide valuable information that allows local agencies to effectively maintain their signal systems while meeting user expectations of safety, efficiency, and travel time. A well designed traffic signal asset management system integrates a variety of data and functional components to meet goals for asset and operational performance.

The seminar will address the topic of pro-active traffic signal asset management. The first half of the seminar draws from previous research to provide a generalized overview of best practices in traffic signal asset management, including fundamentals of transportation asset management and the historical state-of-practice. The presentation will also provide a framework for a model traffic signal management system, as well as discuss the measurement of asset performance and service life. A brief outline of the seminar is listed below and AOC members are requested to provide comments, suggest potential speakers/projects related to the topic:

I. Asset Management

- a. Infrastructure Asset Management
- b. IT Asset Management
- c. Transportation Asset Management

II. Transportation Asset Management (TAM)

- a. Categories
- b. Maturity of Asset Management
- c. Core questions answered by a successful TAM
- d. MAP-21 measures compared to TAM guide measures

III. Applying Asset Management to Signal Systems

- a. Core Principles
 - i. Policy Driven
 - ii. Performance-Based
 - 1. Asset Performance Measures
 - 2. Operational Performance Measures
 - iii. Analysis of Options and Tradeoffs
 - iv. Decisions Based on Quality Information
 - v. Monitoring to Provide Clear Accountability and Feedback
- b. Historical State of Practice
 - i. General Accounting Office Report
 - ii. Systems Engineering Processes Study
 - iii. Findings of National Traffic Signal Report Card
 - iv. FHWA State-of-the-Practice Review
 - 1. Agency Characteristics
 - 2. Use of software tools
 - 3. Collection and Uses of Data
 - 4. Signal Improvement Priorities
 - 5. Tradeoffs
 - v. Benefits of Proactive Signal System Maintenance

IV. State-of-the-Art Traffic Signal Asset Management and System Characteristics

- a. **Overview of Signal System Characteristics**
 - i. Physical Characteristics (signal heads, structures, controllers, detectors, communications system, central control hardware and software)
 - ii. Operations Characteristics (timing plans, coordination, control strategies, pre-emption/priority, detector placement)
 - iii. Operating Environment (road network, intersection geometry, rail crossings, volume, composition and distribution of traffic)
 - iv. Performance Characteristics (traffic flow efficiency, throughput, reliability (failure rates or down-time), travel time and delay, safety)
 - v. Applications (operations, upgrades, preservation, repairs)
 - vi. Resources (staff, expertise; vehicles, equipment, contracts, complaints)
 - vii. Budgets
 - viii. Funding
- b. **Aspects** of a model signal system asset management system – Holistic, integrated view of physical, system and personnel
- c. **Elements of a Signal System Asset Management System (SSAMS)**
 - i. Best Practices
 - ii. Decision processes supported by a SSAMS
 - 1. Daily Operations and Management
 - 2. Identification of System Deficiencies
 - 3. Development and Evaluation of Preservation and Improvement Options
 - 4. Resource Allocation and Budgeting
 - iii. Key Elements of a SSAMS
 - 1. Data Components
 - 2. Functional Components
 - 3. Relationship between Business Processes and SSAMS Components
 - 4. Relationship of SSAMS Components to Physical, Systems, and Personnel Elements of Signal Systems Asset Management
 - iv. Using SSAMS to Identify Deficiencies
 - 1. Signal Downtime

- 2. Suboptimal Timing Plans
 - 3. Isolated Signals
- d. **Signal System Improvements**
 - i. Conservative
 - ii. Moderate
 - iii. Aggressive
- e. **Measuring Asset Performance**
 - i. Aspects of performance
 - ii. Frequency of performance assessment
 - iii. Data collection methods for signal condition and performance
- f. **Asset Service Life**
 - i. Methods of estimation
 - 1. Predictive models or management information systems
 - 2. Development and use of life-cycle cost analyses to compare performance and costs of alternative components
 - 3. Documented agency experience – historical databases or other records
 - 4. Literature describing service-life experience by others
 - 5. Professional judgment of agency staff
 - 6. Manufacturer’s performance data
- g. **Maintenance**
 - i. Frequency
- h. **Customer Satisfaction Measures**
 - i. System Integration for complaint resolution
 - ii. Historical record and documentation
 - iii. Statistical Analysis

V. Examples of Asset Management by Local Agencies and/or Vendors (2 or 3)

- a. **TBD**

Seminar Agenda *(Tentative):*

1:00 – 1:15 pm (15 min)Introductions
 1:15 – 2:00 pm (45 min)Overview of Transportation Asset Management*
 2:00 – 2:15 pm (15 min)Break
 2:15 – 3:00 pm (45 min)Traffic Signal Asset Management and System Characteristics*
 3:00 – 3:15 pm (15 min)Break
 3:15 – 4:30 pm (90 min) Examples of Asset Management by Local Agencies and/or Vendors*
 4:30pm.....Adjourn

**includes Q&A of 10 mins after each presentation/speaker*

Available Seminar Dates *(Choose One):*

- 1) Wed, March 5, 2014
- 2) Mon, March 10, 2014
- 3) Tue, March 11, 2014 *(Coincides with the March meeting, making this a full-day AOC event!)*

AOC members are requested to review the above seminar outline and provide any comments to Vamsi Tabjulu at 510.817.5936 or vtabjulu@mtc.ca.gov by **Mon, Jan 27, 2014**



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Memorandum

TO: Arterial Operations Committee

DATE: Jan 15, 2014

FR: Vamsi Tabjulu

W. I.: 1234

RE: **Program for Arterial System Synchronization (PASS)**

The purpose of the PASS is to provide technical assistance to Bay Area agencies to help improve the safe and efficient operation of certain traffic signal systems and corridors. The PASS aims to provide high-quality technical assistance and project management in a cost-effective manner. MTC will administer and manage this Program, but the primary responsibility for the operation and retiming of traffic signals resides with the agency that owns them.

PASS FY 12/13 Cycle – Draft Fact Sheets with Overall Benefits Summary

This cycle of the PASS had a total of 18 projects consisting of 352 traffic signals from seven counties in the Bay Area. Travel time runs were conducted by the PASS consultants before and after the new timings were implemented to evaluate various performance measures. The evaluation results demonstrate that the program continues to provide significant mobility and environmental benefits across all modes at relatively low costs. The summary of lifetime benefits from all projects, except the traffic responsive project with Santa Clara County, is listed below:

Benefit-cost Summary:

- Auto Travel Time Savings: 21% or over 2 million hours
- Auto Fuel Consumption Savings: 16% or over 5.33 million gallons
- Average Auto Speed Increase: 28%
- Auto ROG Emissions Reduction: 38.21 tons
- Auto NOx Emissions Reduction: 47.73 tons
- Auto PM10 Emissions Reduction: 7.24 tons
- Auto CO Emissions Reduction: 236.62 tons
- Total Auto Emissions Reduction: 329.80 tons
- Transit Travel Time Savings: 6% or 48,000 hours
- Average Transit Speed Increase: 7%

-
- Total Project Costs: **\$1,245,780**
 - Total Lifetime Benefits: **\$67,214,230**
 - **Overall Benefit-cost ratio is 54 : 1**

The draft Fact Sheets for these projects, including an overall benefit-cost summary, is attached at the end of this packet. They each provide the following information for each project at a glance: brief project description, vicinity map, before and after performance charts, benefits to various modes, and benefit-cost analysis summary.

PASS FY 13/14 Cycle Updates

This current cycle has a total of 20 projects consisting of 550 traffic signals from six counties in the Bay Area. MTC, in partnership with Caltrans and project stakeholders, has finalized the Scope, Schedule, and Budgets (SSBs) for all these projects. The analysis of the traffic counts and the review of existing conditions have been completed for a majority of projects. The next step is to develop new signal timing recommendations and implement optimized signal timing plans by the end of May 2014. These projects will be completed in accordance with the PASS guidelines and based on input from all project stakeholders.

PASS FY 14/15 Cycle – Feedback Requested for Call for Projects (CFP)

In preparation for the next cycle of the PASS, MTC is requesting members and current/former PASS project sponsors to provide feedback on the program guidelines. The guidelines will form the basis for project selection and approval of services for each project. MTC is not proposing any major changes to the guidelines from last year, and members are requested to review them online at: http://mtc.ca.gov/services/arterial_operations/pass.htm.

The CFP will follow the same schedule as last year. It will be released in April 2014 and the project selections will be completed by July 2014. The applications from the previous cycles of the PASS will not be considered or reviewed. Interested applicants need to submit the grant applications using the new application form that will be included with the CFP. The local agencies that have signed a valid indemnification agreement with MTC -- for any PASS project in the last four years -- are exempted from the requirement to submit the agreement. MTC anticipates renewing the current PASS consultant contracts for one more year.

AOC members are requested to provide their comments on the Fact Sheets and the CFP to Vamsi Tabjulu at 510.817.5936 or vtabjulu@mtc.ca.gov by **Mon, Jan 27, 2014**



METROPOLITAN TRANSPORTATION COMMISSION

Program for Arterial System Synchronization (PASS)

FY 12/13 Cycle - Fact Sheets

draft

TABLE OF CONTENTS

- PASS FY 12/13 CYCLE SUMMARY

- PROJECT FACT SHEETS FOR:

CITY OF NOVATO | CALTRANS

CITY OF PETALUMA | CALTRANS

CITY OF PINOLE | CITY OF RICHMOND | CALTRANS

CITY OF DUBLIN

CITY OF EMERYVILLE | CITY OF OAKLAND | CALTRANS

CITY OF FREMONT | CALTRANS

CITY OF LIVERMORE | CALTRANS

CITY OF OAKLAND

CITY OF UNION CITY | CALTRANS

CITY OF CUPERTINO

TOWN OF LOS GATOS

CITY OF MOUNTAIN VIEW | CALTRANS

CITY OF SAN JOSE

COUNTY OF SANTA CLARA

CITY OF DALY CITY | CALTRANS

CITY OF FOSTER CITY | CALTRANS

CITY OF MENLO PARK | TOWN OF ATHERTON | CALTRANS

PASS FY 12/13 CYCLE

The purpose of the Program for Arterial System Synchronization (PASS) is to provide technical and financial assistance to Bay Area agencies to help improve the safe and efficient operation of certain traffic signal systems and corridors. The PASS provides traffic engineering assistance to local jurisdictions in retiming their traffic signals.

This cycle of the PASS had a total of 18 projects, listed in the table below, consisting of 352 traffic signals from seven counties in the Bay Area. MTC, in partnership with Caltrans and the local agencies, has successfully completed these projects. In this cycle, 74 Caltrans signals were coordinated with local agency signals along major arterials in the Bay Area.

As a part of each project, new traffic counts were collected in the field to understand the traffic patterns and volumes along the corridors. The 7-day 24-hour volume counts (ADT), peak period turning movement counts, bicycle and pedestrian counts, and historical collision data were analyzed in developing and implementing new signal coordination plans. Field implementation and fine-tuning, are the last but the most important tasks to successfully achieve traffic progression. To provide a common time-source for Caltrans and local signals, over 77 GPS clocks were procured and installed for several projects. This time synchronizing enabled the coordination of state and local signals along some major arterials for the first time. When requested, the PASS also provides project sponsors with the technical help needed to address any issues or citizen complaints received for up to one year after the completion of the PASS project.

The Project Fact Sheets in the following pages provide an overview, project map, comparison charts, benefits to various modes, and the benefit-cost analysis information at a glance.

BENEFIT-COST SUMMARY

- ⦿ Auto Travel Time Savings: 21% or over 2 million hours
- ⦿ Auto Fuel Consumption Savings: 16% or over 5.33 million gallons
- ⦿ Average Auto Speed Increase: 28%
- ⦿ Auto ROG Emissions Reduction: 38.21 tons
- ⦿ Auto NOx Emissions Reduction: 47.73 tons
- ⦿ Auto PM10 Emissions Reduction: 7.24 tons
- ⦿ Auto CO Emissions Reduction: 236.62 tons
- ⦿ Total Auto Emissions Reduction: 329.80 tons
- ⦿ Transit Travel Time Savings: 6% or 48,000 hours
- ⦿ Average Transit Speed Increase: 7%

Total Project Costs: \$1,245,780

Total Lifetime Benefits: \$67,214,230

Overall Benefit-cost ratio is 54 : 1

OTHER BENEFITS

The optimized signal timing plans were developed and implemented based on the recently adopted CA MUTCD guidelines. The pedestrian walking speed was reduced to 3.5 feet per sec. (previously 4.0 feet per sec.), providing adequate crossing time for pedestrians. To enhance pedestrian safety, lower walking speeds were used at intersections with children and senior citizens. The minimum green time was reviewed and increased at many intersections to enhance safety for bicyclists while crossing the intersection. The yellow time and all-red timing parameters were reviewed and updated to provide additional clearance time for the vehicular traffic to clear or stop safely at the intersections. The timing plans were optimized to reduce unnecessary delays along the side streets and achieve progression along the corridors.

#	County	Project Sponsors	# of Signals	Timing Plans/Services	Consultant
1	MA	City of Novato, Caltrans	35	Weekday; Weekend Plans	URS Corporation
2	SN	City of Petaluma, Caltrans	14	Weekday; Post-construction Plans	TJKM Consultants
3	CC	City of Pinole, City of Richmond; Caltrans	22	Weekday; School Peak Plans	Kimley-Horn
4	AL	ACPWA, Caltrans	18	Weekday Plans	TJKM Consultants
5	AL	City of Dublin	21	Weekday Plans; TSP; SIC	TJKM Consultants
6	AL	City of Emeryville, City of Oakland, Caltrans	32	Weekday; Weekend Plans; TSP	Kimley-Horn
7	AL	City of Fremont, Caltrans	9	Weekday; School Plans	Kimley-Horn
8	AL	City of Livermore; Caltrans	39	Weekday; IM Flush Plans	Kimley-Horn
9	AL	City of Oakland	20	Weekday Plans	TJKM Consultants
10	AL	City of Union City, Caltrans	12	Weekday; School Plans; SIC	Kimley-Horn
11	SCL	City of Cupertino	14	Weekday; School Plans; TSP	Kimley-Horn
12	SCL	Town of Los Gatos	9	Weekday; School Plans	TJKM Consultants
13	SCL	City of Mountain View, Caltrans	15	Weekday Plans; Traffic Studies	TJKM Consultants
14	SCL	City of San Jose	14	Weekend Plans	Kimley-Horn
15	SCL	County of Santa Clara	26	Weekday, Weekend; TR	Kimley-Horn
16	SM	City of Daly City, Caltrans	11	Weekday; Weekend Plans	Kimley-Horn
17	SM	City of Foster City, Caltrans	24	Weekday; Post Construction Plans	TJKM Consultants
18	SM	City of Menlo Park, Town of Atherton, Caltrans	16	Weekday Plans	TJKM Consultants

*TSP = Transit Signal Priority; IM = Incident Management; SIC = Signal Interconnect; TR: Traffic Responsive

PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

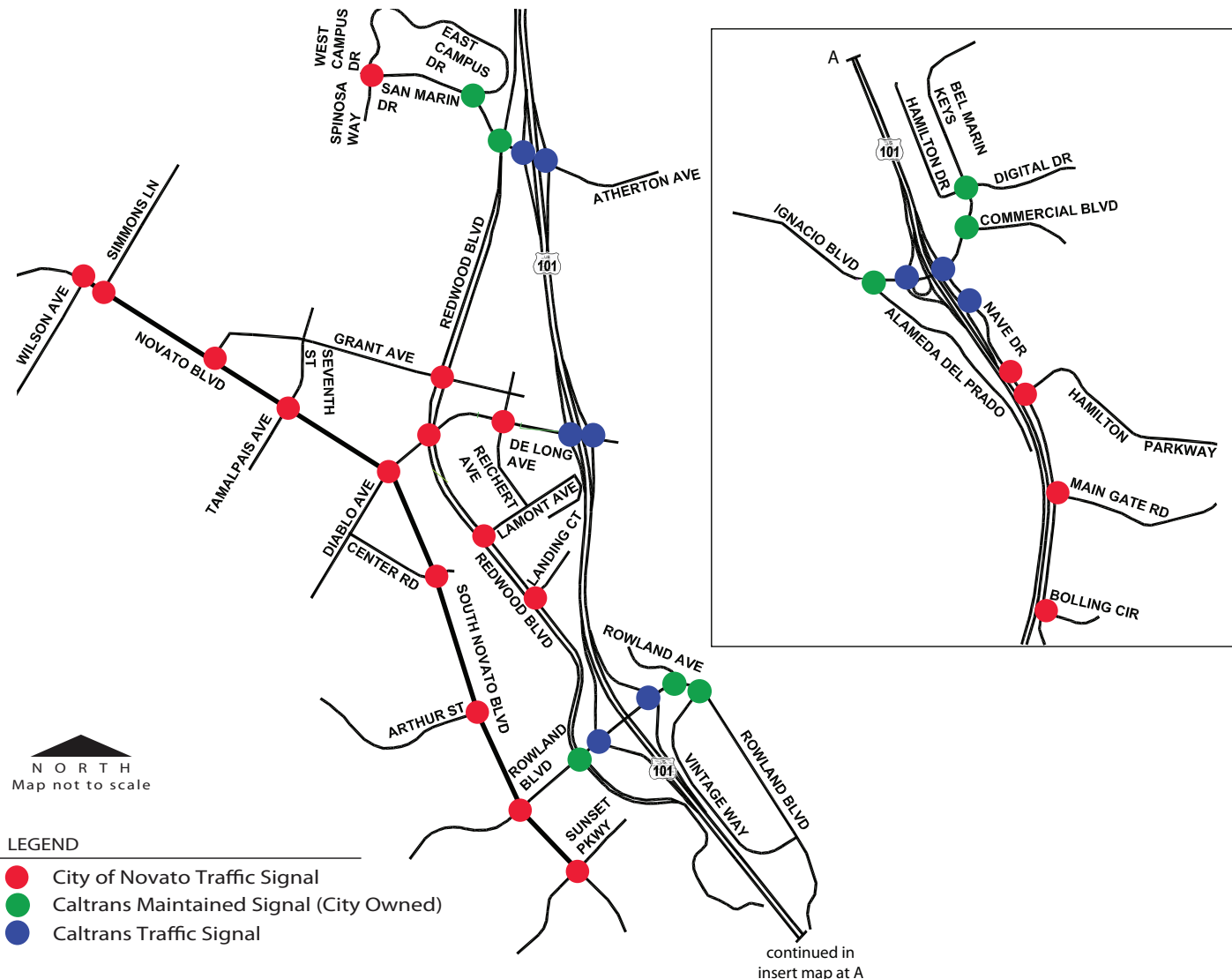
Novato City-wide Traffic Signal Timing Project

City of Novato | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Novato received a grant from the Metropolitan Transportation Commission's Program for Arterial System Synchronization (PASS) to develop and implement optimized timing plans for weekday AM, midday, and PM peak periods for 35 signals city-wide, and weekend AM and PM periods for five signals along Rowland Blvd. The corridors encompass all major arterials -- as shown in the adjacent map -- within the City of Novato: San Marin Dr, Diablo/De Long Ave, Rowland Blvd, Ignacio/Bel Marin Key Blvd, Redwood Blvd, Novato Blvd and Nave Dr.

These corridors serve as a vital link for regional transit services from Golden Gate Transit and Marin County Transit. This PASS project involved the completion of the following major tasks: 1) collecting traffic volumes and turning movement counts, including bike and pedestrian counts, at all project intersections; 2) analyzing this traffic data including collision data to develop optimized signal timing plans; 3) implementing and fine-tuning the plans in the field; and 4) conducting travel time surveys to analyze the performance of the new timing plans, including the any effects on transit travel time and speed.



GPS SIGNAL COMMUNICATIONS

To provide a common time-source and enable communication between the City and Caltrans signals cost-effectively, GPS devices were installed at all 35 project intersections. These devices enable the signal controllers to regularly synchronize their clocks, efficiently deploy the timing plans at the same time, and thus help maintain the efficiency of signal coordination.

BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety of bicyclists -- based on the new CA policy directives -- the minimum green time was increased at all project intersections to enable them to safely cross the intersection.



BENEFITS TO PEDESTRIANS: For improved safety, the pedestrian crossing timings were increased at all of the project intersections based on

the current standards. Despite the increase in pedestrian timings, travel time savings for autos were achieved by efficiently allocating and maximizing the use of available time.



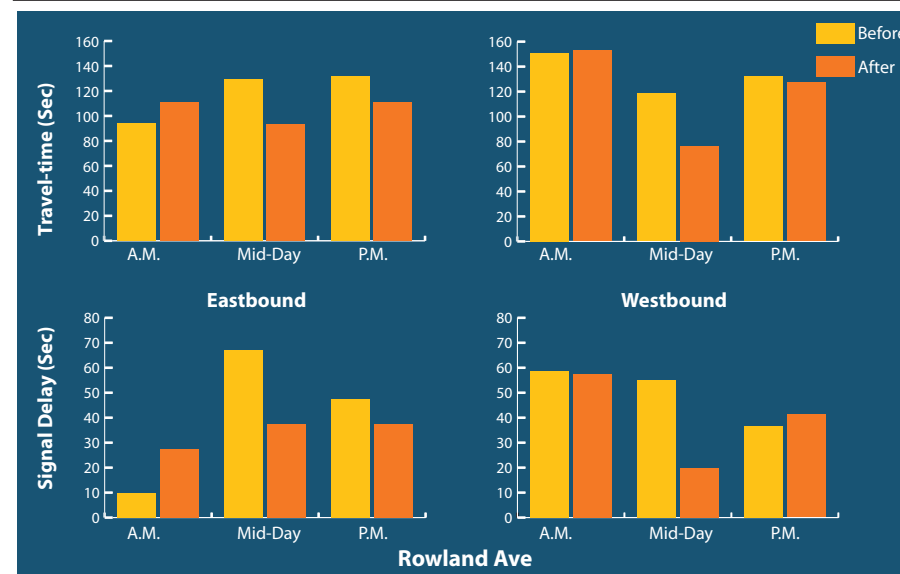
BENEFITS TO TRANSIT: To assess the impacts on transit, travel time runs on transit vehicles were conducted both before and after the new timings were implemented. These evaluation results, as shown in the table to the right, demonstrate that the project provides significant benefits to transit without any negative impacts on autos.

Project Costs	
Consultant Costs (Basic Services/Plans, Additional Plans, IM Flush Plans, etc.)	\$124,800
Other Project Costs (Communications Equipment, etc.)	\$18,000
Agency Staff Costs (Estimate)	\$25,825
Total Costs	\$168,625

Project Benefits				
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	36,786 hrs.	\$702,166	183,932 hrs.	\$3,510,832
Fuel Consumption Savings	116,257 gal.	\$467,206	581,283 gal.	\$2,336,030
ROG Emissions Reduction	0.70 tons	\$876	3.48 tons	\$4,382
NOx Emissions Reduction	0.78 tons	\$13,989	3.89 tons	\$69,943
PM10 Emissions Reduction	0.14 tons	\$20,151	0.69 tons	\$100,757
CO Emissions Reduction	5.56 tons	\$430	27.79 tons	\$2,148
Total Lifetime Benefits				\$6,024,091
Transit Travel Time Savings	1,104 hrs.	\$21,077	5,521 hrs.	\$105,387
Total Lifetime Benefits with Transit				\$6,129,478

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	16%	9%
Average Speed Increase	18%	12%
Average Fuel Savings	15%	N/A
Average Reduction in Signal Delay	31%	N/A
Average Reduction in Number of Stops	36%	N/A

Overall Benefit-cost Ratio 42:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 31%

Average Reduction in Number of Stops: 36%

Auto Fuel Consumption Savings: 15% or 581,283 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 35.85 tons

Auto Travel Time Savings: 16% or 183,932 hours



Overall Project Benefit-cost Ratio = 42:1

MTC CONTACT:

Vamsi Tabjulu

Arterial Operations Program Manager

VTabjulu@mtc.ca.gov

510.325.3462

Project Consultant:

URS Corporation



PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

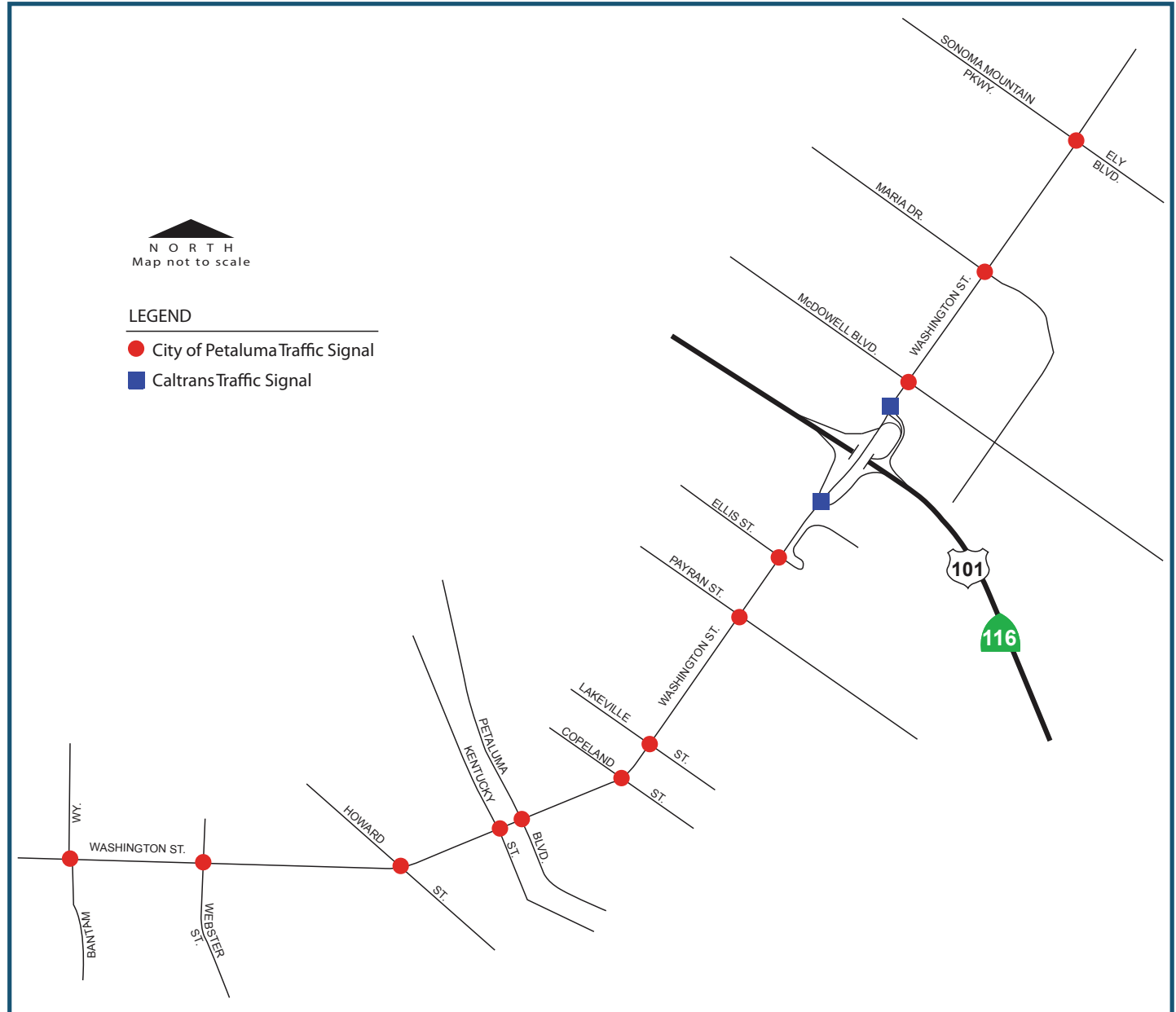
Washington St ■ Traffic Signal Timing Project

City of Petaluma | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Petaluma received a Program for Arterial Synchronization (PASS) grant from the Metropolitan Transportation Commission to develop and implement new signal timings plans for 14 signals along Washington St and Bodega Ave. The goal of this project was to develop traffic signal timing plans for weekday AM, midday, and PM peak periods to achieve operational efficiency with the existing capacity constraints, and additional plans to implement after the completion of the Caltrans construction activity at one of the intersections.

This PASS project involved the completion of the following major tasks: collecting traffic volumes (ADT) and turning movement counts, including bike and pedestrian counts, at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans, including the effects on transit. The performance evaluation results show reduced congestion and signal delay, and improved travel time and safety for all modes along this major arterial in the City of Petaluma.



POST-CONSTRUCTION TIMING PLANS

Since there were two construction projects that would change the traffic patterns and lane configuration at the Washington St and US 101 Ramps, the PASS project developed timing plans for immediate deployment to alleviate congestion during construction, and post-construction timing plans to implement after the completion of the construction.

BENEFITS TO VARIOUS MODES



BENEFITS TO PEDESTRIANS:

The Walk timing and Flash Don't Walk clearance timing parameters were updated to provide adequate time for children and seniors to safely cross the intersections. The updated timing parameters are expected to enhance the central business district crossings at Washington St/Petaluma Blvd and Washington St/Kentucky St. The increased pedestrian timings had a slight impact on transit travel times but not a significant impact.



BENEFITS TO TRAFFIC SAFETY:

To enhance traffic safety, the yellow clearance timing parameters were updated based on posted speed limits at nine intersections along Washington St.



BENEFITS TO BICYCLISTS:

Per the new California policy directive, the minimum green time was increased for the through movements at all fourteen-study intersections to enhance traffic safety for bicyclists traveling along the Washington St corridor from Ely Blvd to Bantam Way.

Project Costs

Consultant Costs (Weekday/IM Flush Plans, Transit Evaluation)	\$46,930
Other Project Costs (Communications Equipment, etc.)	\$1,000
Agency Staff Costs (Estimate)	\$2,808
Total Costs	\$50,738

Project Benefits

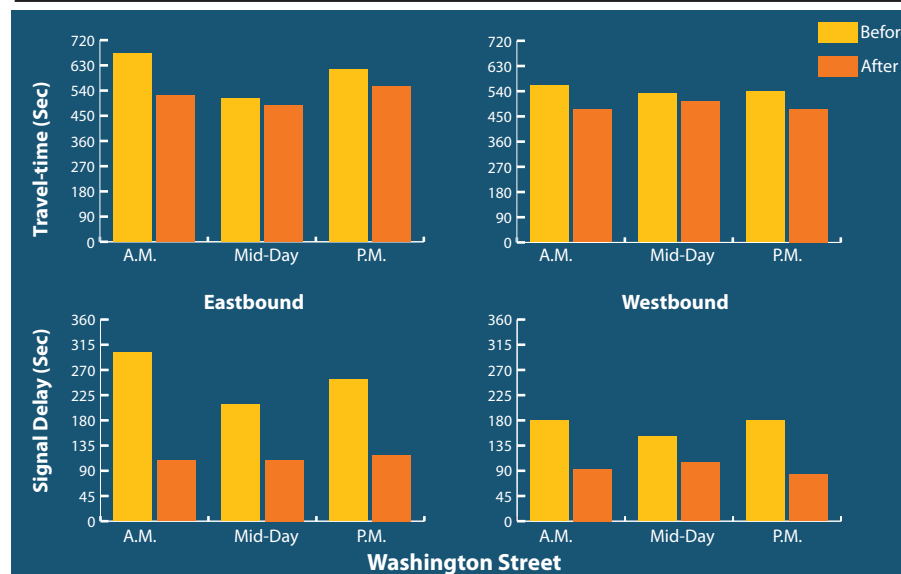
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	10,648 hrs.	\$203,247	53,241 hrs.	\$1,016,237
Fuel Consumption Savings	20,733 gal.	\$83,320	103,664 gal.	\$416,601
ROG Emissions Reduction	0.16 tons	\$197	0.78 tons	\$984
NOx Emissions Reduction	0.19 tons	\$3,487	0.97 tons	\$17,437
PM10 Emissions Reduction	0.03 tons	\$4,317	0.15 tons	\$21,586
CO Emissions Reduction	0.9 tons	\$70	4.51 tons	\$348
Total Lifetime Benefits				\$1,473,194

Transit Travel Time Savings	(27) hrs.	(\$513)	(134) hrs.	(\$2,567)
Total Lifetime Benefits with Transit				\$1,470,628

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	12%	(2%)
Average Speed Increase	14%	(2%)
Average Fuel Savings	9%	N/A
Average Reduction in Signal Delay	50%	N/A
Average Reduction in Number of Stops	25%	N/A

Overall Benefit-cost Ratio

37:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 50%

Average Reduction in Number of Stops: 25%

Auto Fuel Consumption Savings: 9% or 103,664 gallons¹



Total Emissions Reduced (ROG, Nox, PM10, CO): 6.41 tons

Auto Travel Time Savings: 12% or 53,241 hours



Average Transit Travel Time delay: 2%

Overall Project Benefit-cost Ratio = 37:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

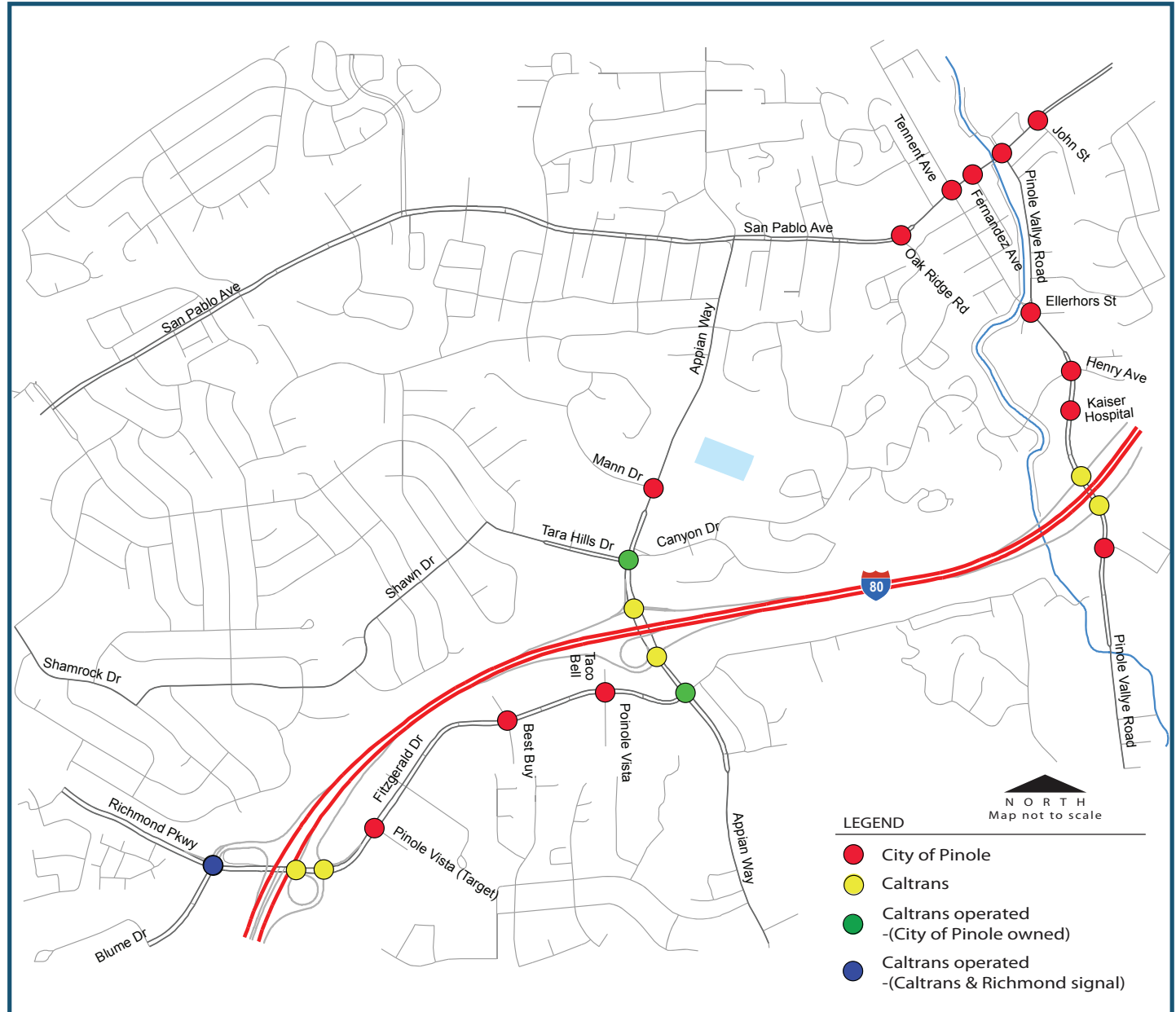
Pinole Valley Rd/San Pablo Ave/Appian Wy/Fitzgerald Dr

City of Pinole | City of Richmond | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Pinole, in conjunction with Caltrans, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to develop and implement optimized signal timing plans for 22 signals along Pinole Valley Rd, San Pablo Ave, Appian Way, and Fitzgerald Dr/Richmond Pkwy.

The PASS project has optimized the signal coordination for the weekday AM and PM peak periods for all of the project intersections, as well as develop additional plans to address congestion during the school AM and PM peak periods for the six intersections along Pinole Valley Rd. The project also included an operational analysis to review lane configuration and phasing for the signals at Pinole Valley Rd/Tennent Ave, a 5-legged intersection with heavy school traffic, and San Pablo Ave/Tennent Ave, with heavy left turn movements. This project was coordinated with the schedule of the I-80 ICM project, which installed the signal interconnect between the traffic signals. The ICM project will also develop incident management flush plans for these corridors.



...IMMEDIATE RESULTS

After the new timing plans were implemented, the auto stops were reduced significantly by 48%. Additional benefits from reduction in stops include reduced vehicle maintenance, and reduced driver frustration. The additional school AM and PM peak signal timing plans resulted in the reduction in queuing and delay at the Pinole Valley Rd/Estates Ave, which was an important goal for the city in this PASS project.

BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety, the minimum green intervals were reviewed for bicyclists on the corridor.

Changes to minimum green intervals were made at four project intersection.



BENEFITS TO PEDESTRIANS:

For improved safety, the pedestrian intervals were reviewed and increased at 14 intersections based on the latest California MUTCD 2012 standards.



BENEFITS TO TRANSIT:

To assess the impacts on transit, travel time runs on transit vehicles were conducted both before and after the new timings were implemented. These evaluation results, as shown in the table to the right, demonstrate that the program provides significant benefits to various modes.



BENEFITS TO TRAFFIC SAFETY:

To enhance traffic safety, the yellow clearance timing parameters were updated based on current standards.

Changes to clearance intervals were made at four project intersections.

Project Costs

Consultant Costs (Basic Services/Plans, School Peak, Transit Travel Time Runs)	\$65,445
Other Project Costs (Signal Operations Analysis)	\$3,300
Agency Staff Costs (Estimate)	\$16,361
Total Costs	\$85,106

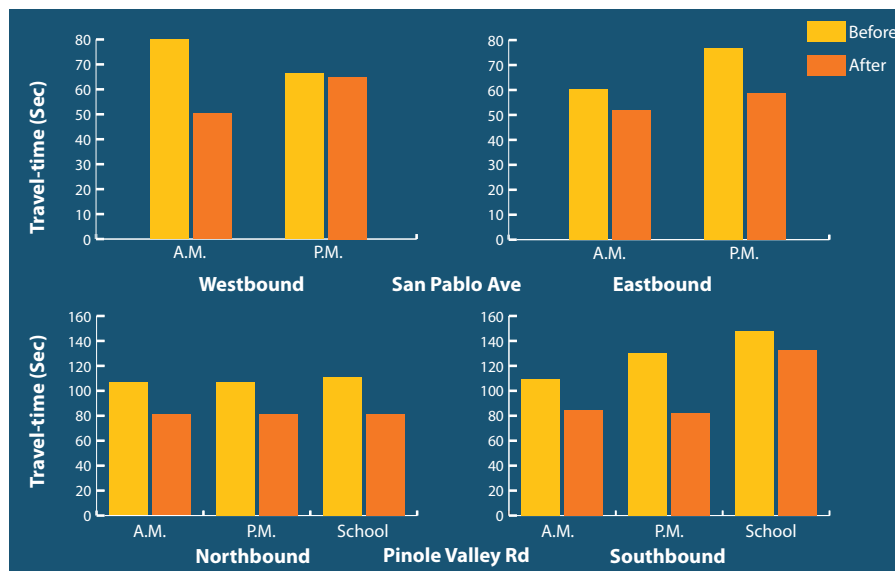
Project Benefits

Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	13,638 hrs.	\$260,311	68,188 hrs.	\$1,301,557
Fuel Consumption Savings	31,726 gal.	\$127,500	158,632 gal.	\$637,501
ROG Emissions Reduction	0.22 tons	\$281	1.12 tons	\$1,405
NOx Emissions Reduction	0.27 tons	\$4,945	1.37 tons	\$24,725
PM10 Emissions Reduction	0.04 tons	\$6,236	0.21 tons	\$31,181
CO Emissions Reduction	1.42 tons	\$110	7.09 tons	\$548
Total Lifetime Benefits				\$1,996,917
Transit Travel Time Savings	63 hrs.	\$1,212	317 hrs.	\$6,058
Total Lifetime Benefits with Transit				\$2,002,975

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	22%	4%
Average Speed Increase	26%	5%
Average Fuel Savings	19%	N/A
Average Reduction in Signal Delay	58%	N/A
Average Reduction in Number of Stops	48%	N/A

Overall Benefit-cost Ratio

25:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 58%

Average Reduction in Number of Stops: 48%

Auto Fuel Consumption Savings: 19% or 158,632 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 9.79 tons

Auto Travel Time Savings: 22% or 68,188 hours



Average Transit Travel Time Savings: 4% or 317 hours

Overall Project Benefit-cost Ratio = 25:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

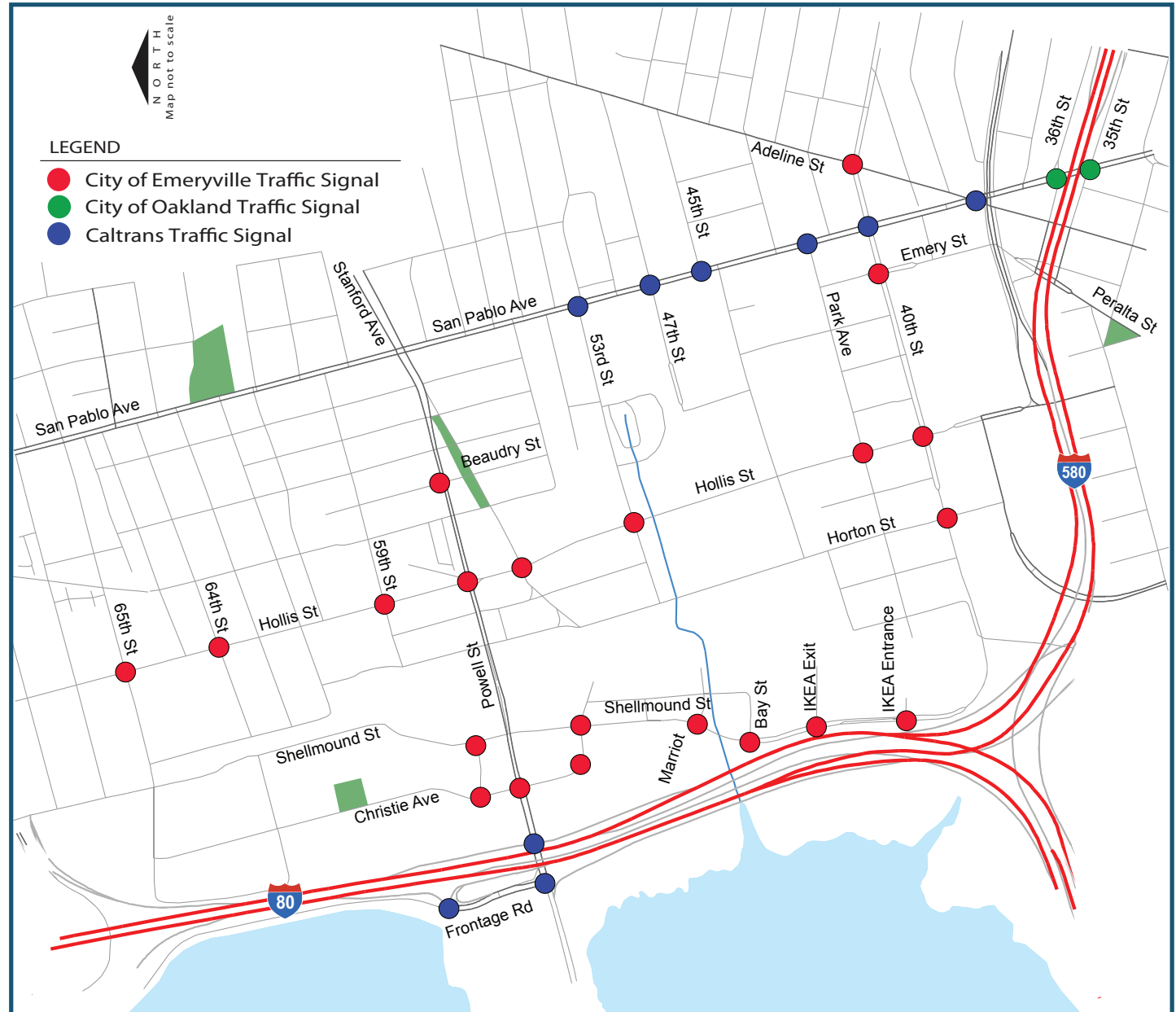
Emeryville City-wide Signal Timing Project

City of Emeryville | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Emeryville, in conjunction with the City of Oakland and Caltrans, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission (MTC) to develop and implement weekday and weekend (except Hollis St) signal coordination plans for 32 signals along San Pablo Ave, Hollis St, 40th St, and the Shellmound St/Christie Ave/Powell St route.

This project also developed transit signal priority (TSP) timing plans for 14 signals and a feasibility study to implement TSP at 10 signals. Based on the study results, TSP was implemented at six additional signals. The schedule of this PASS project was coordinated with the I-80 Integrated Corridor Mobility (ICM) project which installed the signal interconnect cable to Powell St at Hollis St intersection to support traffic signal coordination along Powell St. The performance evaluation shows reduced congestion, stops, signal delay and travel time; anticipated reduction in harmful greenhouse gas emissions; and improve traffic safety for all modes of users.



TRANSIT SIGNAL PRIORITY (TSP)



The PASS procured and provided support for the installation of

16 Opticom Priority LED Emitters on all of the Emery Go-Round buses to enable signal priority for these buses. This shuttle service provides free transportation to Emeryville residents, shoppers, visitors and employees of local businesses by serving various routes throughout the city with a frequency of 10-15 minutes seven days a week.

BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety for bicyclists, the minimum green intervals were reviewed and updated at 27 project intersections.



BENEFITS TO PEDESTRIANS: For improved safety, the pedestrian crossing intervals were reviewed and increased at 16 intersections based on

the current 2012 California MUTCD standards.



BENEFITS TO TRANSIT: The project included updating and emulating TSP settings at 14 intersections, and deploying new TSP timings at six intersections. These updated settings are expected to reduce transit delays and stops.



BENEFITS TO TRAFFIC SAFETY: To enhance traffic safety, the yellow clearance timing parameters were updated based on current standards.

Changes to clearance intervals were made at 12 project intersections.

Project Costs

Consultant Costs (Weekday/end Timing, Transit Travel Time Runs, TSP Timing, Timing Sheets)	\$164,285
Other Project Costs (TSP Feasibility Study)	\$5,280
Agency Staff Costs (Estimate)	\$41,071
Total Costs	\$210,636

Project Benefits

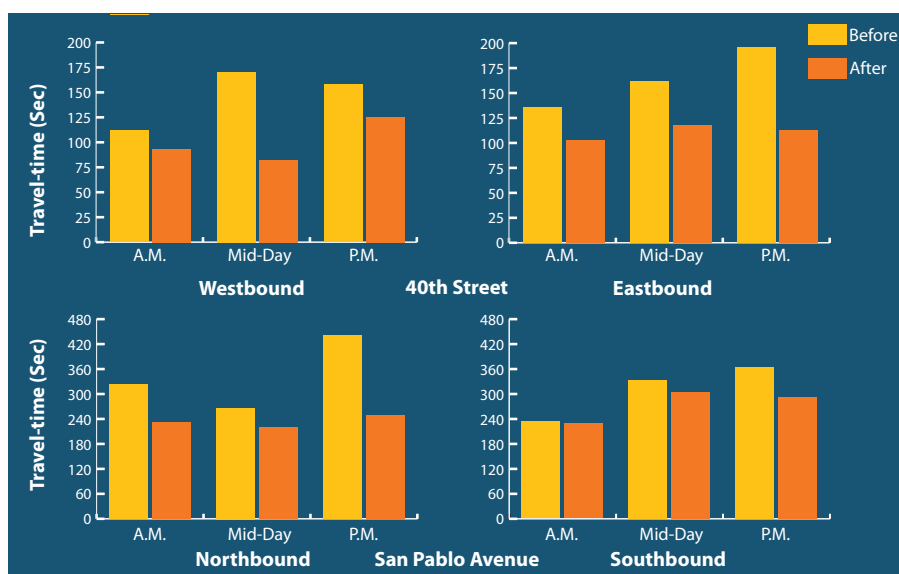
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	29,346 hrs.	\$560,154	146,732 hrs.	\$2,800,771
Fuel Consumption Savings	90,087 gal.	\$362,036	450,434 gal.	\$1,810,181
ROG Emissions Reduction	0.77 tons	\$975	3.87 tons	\$4,874
NOx Emissions Reduction	1.03 tons	\$18,620	5.17 tons	\$93,100
PM10 Emissions Reduction	0.14 tons	\$20,081	0.69 tons	\$100,407
CO Emissions Reduction	3.83 tons	\$296	19.14 tons	\$1,480
Total Lifetime Benefits				\$4,810,814

Transit Travel Time Savings	2,712 hrs.	\$51,771	13,561 hrs.	\$258,854
Total Lifetime Benefits with Transit				\$5,069,668

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	19%	5%
Average Speed Increase	39%	4%
Average Fuel Savings	13%	N/A
Average Reduction in Signal Delay	42%	N/A
Average Reduction in Number of Stops	34%	N/A

Overall Benefit-cost Ratio

25:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 42%

Average Reduction in Number of Stops: 34%

Auto Fuel Consumption Savings: 13% or 450,434 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 28.87 tons

Auto Travel Time Savings: 19% or 146,732 hours



Average Transit Travel Time Savings: 5% or 13,561 hours

Overall Project Benefit-cost Ratio = 25:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

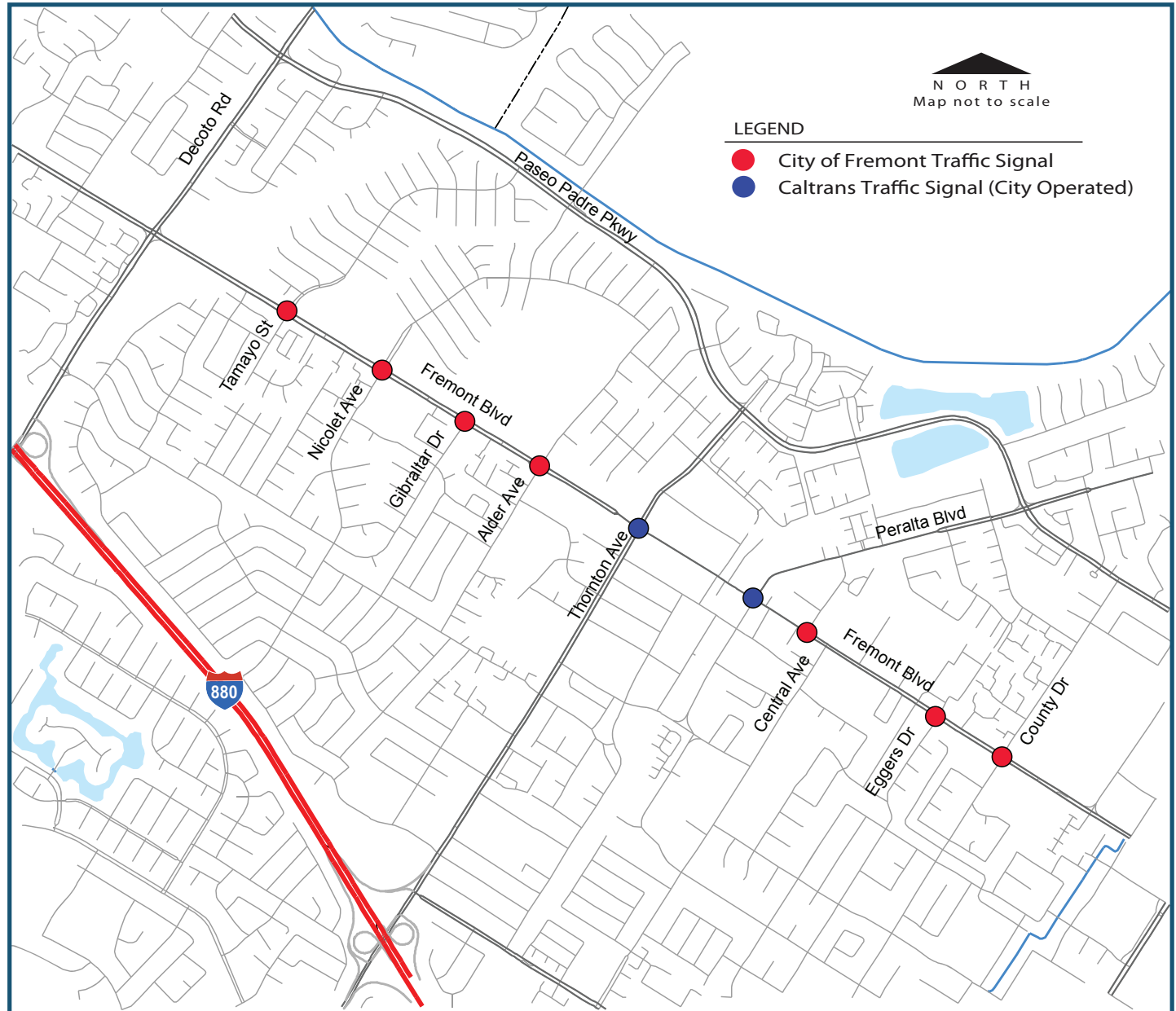
Fremont Blvd ■ Traffic Signal Timing Project

City of Fremont | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Fremont received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to optimize and coordinate traffic signals during weekday AM, midday and PM for nine intersections along Fremont Blvd between Tamayo St and Country Dr. In addition, the project included development and implementation of an AM school peak coordination plan to address congestion near schools along the corridor.

This PASS project involved the completion of the following major tasks: 1) collecting traffic volumes (ADT) and turning movement counts, including bike and pedestrian counts, at all project intersections; 2) analyzing this traffic data including collision data to develop optimized signal timing plans; 3) implementing and fine-tuning the plans in the field; and 4) conducting travel time surveys to analyze the performance of the new timing plans, including the effects on transit.



BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety, the minimum green intervals were reviewed for bicyclists on the corridor.

Changes to minimum green intervals were made at one project intersection.



BENEFITS TO PEDESTRIANS: For improved safety, the pedestrian intervals were reviewed and increased at

most intersections based on current 2012 California MUTCD standards. Changes to pedestrian timing were made at all nine project intersections.



BENEFITS TO TRANSIT: To assess the impacts on transit, travel time runs on transit vehicles were conducted both

before and after the new timings were implemented. These evaluation results, as shown in the table to the right, demonstrate that the project provides 5% travel time savings for buses along this corridor.



BENEFITS TO TRAFFIC SAFETY: To enhance traffic safety, the yellow clearance timing parameters were updated

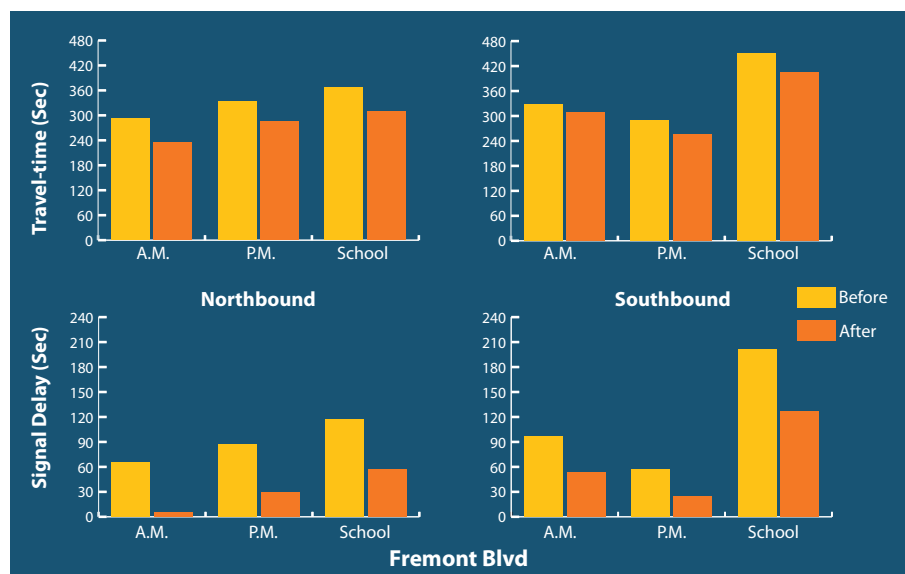
based on current standards. Changes to clearance intervals were required at two project intersections. The performance results show a reduction of 50% in the number of stops which is a major factor for secondary and rear end collisions.

Project Costs	
Consultant Costs (Weekday Peak Coordination Plans, Transit Travel Time Runs)	\$28,290
Other Project Costs (Additional ADT count, and Visio Covers)	\$815
Agency Staff Costs (Estimate)	\$5,590
Total Costs	\$35,055

Project Benefits				
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	10,772 hrs.	\$205,614	53,860 hrs.	\$1,028,069
Fuel Consumption Savings	25,667 gal.	\$103,148	128,333 gal.	\$515,739
ROG Emissions Reduction	0.14 tons	\$177	0.70 tons	\$883
NOx Emissions Reduction	0.16 tons	\$2,877	0.80 tons	\$14,383
PM10 Emissions Reduction	0.03 tons	\$4,232	0.15 tons	\$21,159
CO Emissions Reduction	1.27 tons	\$98	6.34 tons	\$490
Total Lifetime Benefits				\$1,580,722
Transit Travel Time Savings	610 hrs.	\$11,641	3,049 hrs.	\$58,204
Total Lifetime Benefits with Transit				\$1,638,926

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	11%	5%
Average Speed Increase	12%	7%
Average Fuel Savings	8%	N/A
Average Reduction in Signal Delay	45%	N/A
Average Reduction in Number of Stops	50%	N/A

Overall Benefit-cost Ratio 47:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 45%

Average Reduction in Number of Stops: 50%

Auto Fuel Consumption Savings: 8% or 128,333 gallons¹



Total Emissions Reduced (ROG, Nox, PM10, CO): 7.99 tons

Auto Travel Time Savings: 11% or 53,860 hours



Average Transit Travel Time Savings: 5% or 3,049 hours

Overall Project Benefit-cost Ratio = 47:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

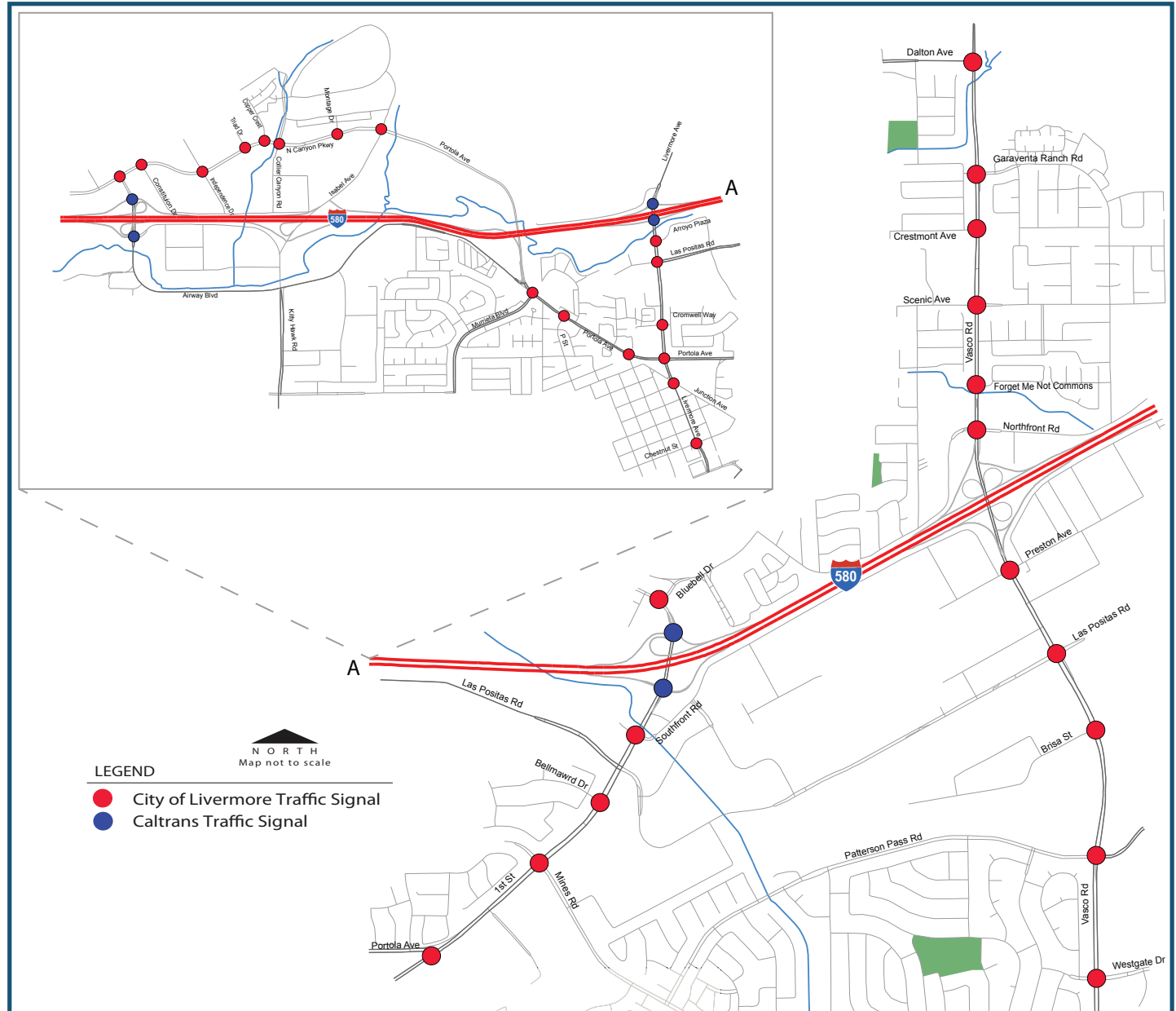
Vasco Rd/First St/Portola Ave/Livermore Ave

City of Livermore | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Livermore, in conjunction with Caltrans, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to optimize signal coordination at 39 signals along N Canyons Pkwy, Portola Ave, Airway Blvd, Portola Ave, Livermore Ave, First St/ Springtown Blvd, and N/S Vasco Rd. The project involved developing the weekday coordination plans for all project signals, and incident management flush plans for signals along N Canyons Pkwy, Portola Ave and Livermore Ave.

The PASS project installed three GPS devices at Caltrans intersections to enable synchronization with the city signals. The following major tasks were completed in this project: collecting traffic volumes (ADT) and turning movement counts, including bike and pedestrian counts, at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans.



INCIDENT MANAGEMENT FLUSH PLANS

The PASS project also developed signal coordination flush plans along North Canyon Pkwy, Portola Ave, and Livermore Ave to help manage the traffic when an incident occurs on the adjacent I-580. These signal timing plans called the Incident Management flush plans aim to effectively take the diverted traffic from the city streets back onto the freeways. The city staff are now able to remotely select and activate these flush plans based on the location and time of the incident on the freeway.

BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety, the minimum green intervals were reviewed for bicyclists on the corridors.

Changes to minimum green intervals were made at 21 project intersections.



BENEFITS TO PEDESTRIANS: For improved safety, the pedestrian intervals were reviewed and increased at most intersections based on

current 2012 California MUTCD standards. Changes to pedestrian timing were made at all 33 project intersections.



BENEFITS TO TRAFFIC SAFETY: To enhance traffic safety, the yellow clearance timing parameters were updated based on current standards.

Changes to clearance intervals were made at 13 project intersections.

Project Costs

Consultant Costs (Basic Services/Plans, Incident Management Flush Plans)	\$97,135
Other Project Costs (Reduced Services, GPS Clocks)	\$710
Agency Staff Costs (Estimate)	\$21,338
Total Costs	\$119,183

Project Benefits

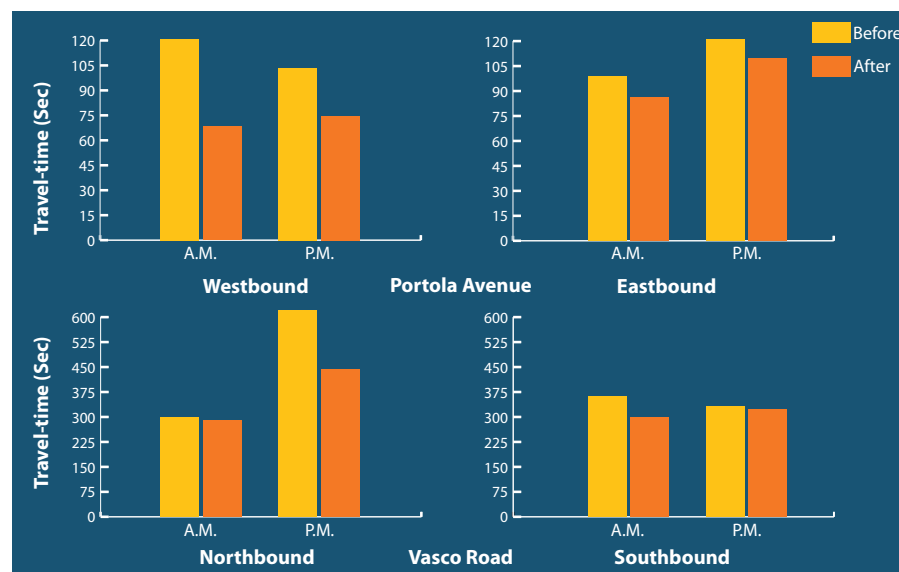
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	16,599 hrs.	\$316,834	82,994 hrs.	\$1,584,169
Fuel Consumption Savings	46,981 gal.	\$188,806	234,906 gal.	\$944,029
ROG Emissions Reduction	0.28 tons	\$356	1.41 tons	\$1,778
NOx Emissions Reduction	0.33 tons	\$5,906	1.64 tons	\$29,532
PM10 Emissions Reduction	0.06 tons	\$8,298	0.29 tons	\$41,491
CO Emissions Reduction	2.25 tons	\$174	11.24 tons	\$869
Total Lifetime Benefits				\$2,601,868

Overall Project Benefits

	Auto
Average Decrease in Travel Time	11%
Average Speed Increase	15%
Average Fuel Savings	8%
Average Reduction in Signal Delay	36%
Average Reduction in Number of Stops	37%

Overall Benefit-cost Ratio

24:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 36%

Average Reduction in Number of Stops: 37%

Auto Fuel Consumption Savings: 8% or 234,906 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 14.58 tons

Auto Travel Time Savings: 11% or 82,994 hours



Overall Project Benefit-cost Ratio = 24:1

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LIVERMORE



PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

Grand Ave ■ Traffic Signal Timing Project

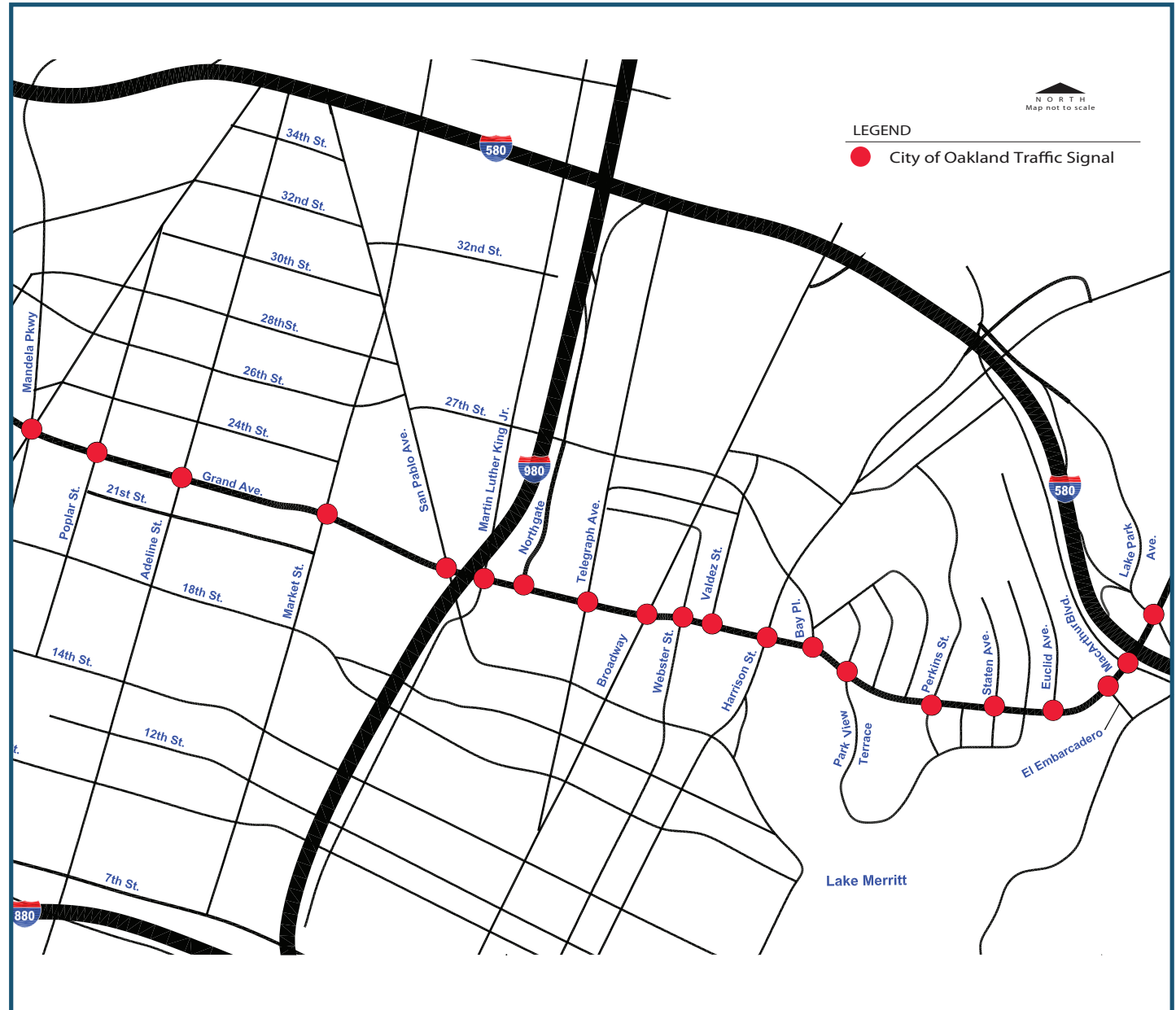
City of Oakland | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Oakland received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to optimize signal timing for 20 signals along Grand Ave. The project conducted timing analysis and developed and implemented signal coordination for the AM, midday, and PM peak periods.

The goal of this project was to facilitate traffic progression along Grand Ave; and to optimize signal timing plans to achieve operational efficiency of the traffic signals.

This corridor serves as a vital link for regional transit services for AC Transit. This PASS project involved the completion of the following major tasks: Collecting traffic volumes and turning movement counts, including bike and pedestrian counts, at all project intersections; Analyzing this traffic data including collision data to develop optimized signal timing plans; Implementing and fine-tuning the plans in the field; and Conducting travel time surveys to analyze the performance of the new timing plans.



BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety, the minimum green intervals were reviewed for bicyclists on the corridor.



BENEFITS TO PEDESTRIANS: For improved safety, the Walk timing and Flash Don't Walk clearance timing parameters were updated to provide

adequate time for children and seniors to safely cross the intersections and to accommodate the 2012 CA MUTCD requirement of walking speed of 3.5 feet/second.



BENEFITS TO TRANSIT: To assess the impacts on transit, travel time runs on transit vehicles were conducted both before and after the new

timings were implemented. These evaluation results, as shown in the table to the right, demonstrate that the project provides significant benefits to transit.



BENEFITS TO TRAFFIC SAFETY: To enhance traffic safety, the yellow clearance timing parameters were updated based on current standards.

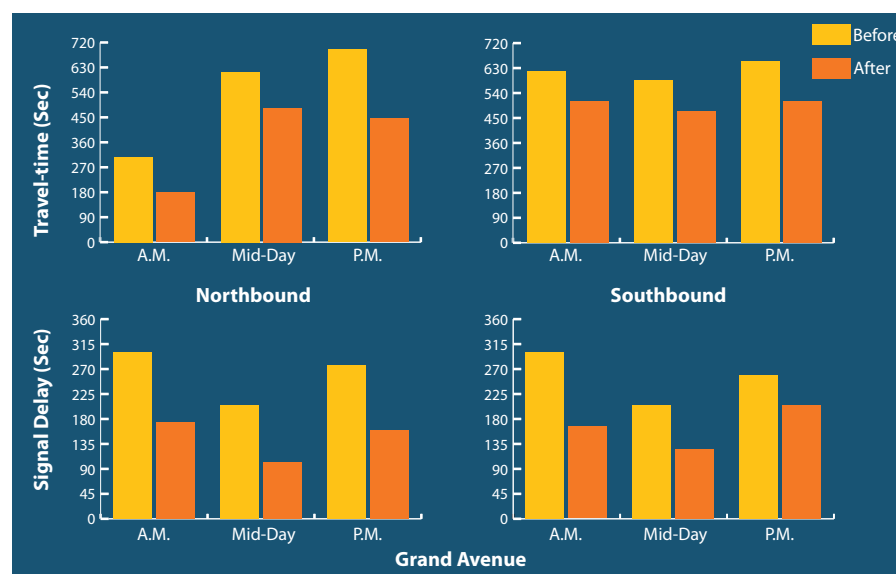
All-red clearance timing parameters were reviewed to be consistent with the city's practices. The performance results show that signal delay and number of stops have reduced significantly, which helps in lowering greenhouse gas emissions, and possibly some secondary and rear-end collisions.

Project Costs	
Consultant Costs (basic Services/Plans, Transit Evaluation)	\$55,615
Other Project Costs	\$0
Agency Staff Costs (Estimate)	\$1,154
Total Costs	\$56,769

Project Benefits				
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	16,568 hrs.	\$316,236	82,838 hrs.	\$1,581,181
Fuel Consumption Savings	60,408 gal.	\$242,766	302,042 gal.	\$1,213,829
ROG Emissions Reduction	0.53 tons	\$664	2.64 tons	\$3,318
NOx Emissions Reduction	0.7 tons	\$12,649	3.51 tons	\$63,247
PM10 Emissions Reduction	0.09 tons	\$13,692	0.47 tons	\$68,458
CO Emissions Reduction	2.57 tons	\$198	12.83 tons	\$992
Total Lifetime Benefits				\$2,931,024
Transit Travel Time Savings	1,322 hrs.	\$25,227	6,608 hrs.	\$126,137
Total Lifetime Benefits with Transit				\$3,057,161

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	23%	12%
Average Speed Increase	30%	15%
Average Fuel Savings	18%	N/A
Average Reduction in Signal Delay	41%	N/A
Average Reduction in Number of Stops	25%	N/A

Overall Benefit-cost Ratio 59:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 41%

Average Reduction in Number of Stops: 25%

Auto Fuel Consumption Savings: 18% or 302,042 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 19.45 tons

Auto Travel Time Savings: 23% or 82,838 hours



Average Travel Time Savings: 12% or 6,608 hours

Overall Project Benefit-cost Ratio = 59:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

Alvarado-Niles Rd ■ Traffic Signal Timing Project

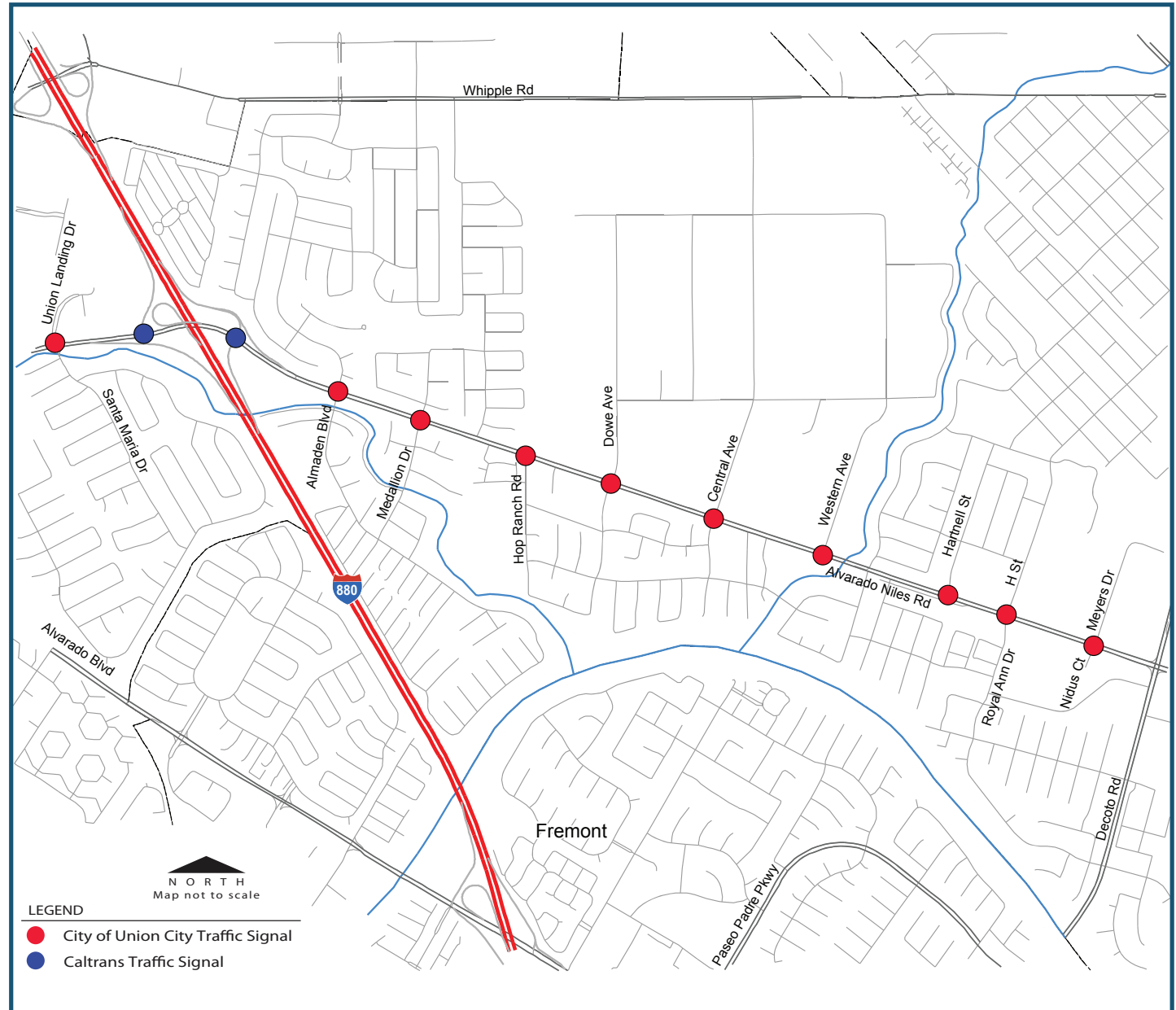
City of Union City | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Union City, in conjunction with Caltrans, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to conduct a signal timing study for 12 signals along Alvarado-Niles Rd. In addition, the project included development and implementation of school peak AM and PM coordination plans to mitigate congestion near schools along the corridor.

The goal of this project was to facilitate traffic progression along the corridor; and to update the signal timing plans to achieve operational efficiency of the traffic signals. Attaining this goal is expected to reduce traffic congestion, reduce traffic delays, reduce the emission of harmful greenhouse gases, reduce travel time along the study corridor, and improve traffic safety.

This PASS project involved the completion of the following major tasks: collecting traffic volumes and turning movement counts -- including bike and pedestrian counts -- at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans.



SIGNAL INTERCONNECT ACROSS I-880

The PASS project also provided funding to install approx. 4,500 feet of signal Interconnect (SIC) to connect the intersections of Alvarado-Niles Rd/Almaden Blvd and Alvarado-Nile Rd/Union Landing Dr and provide direct communication to the City Hall TMC. The city used an existing 3" conduit across the I-880 interchange and installed the cable with the help of city's contractor. With the closure of this SIC gap, intersections to the west of I-880 are directly communicating to the TMC, and receiving continuous time updates from the new GPS device installed at the TMC.

BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety, the minimum green intervals were reviewed for bicyclists on the corridor. Changes to minimum green intervals were made at all project intersections.



BENEFITS TO PEDESTRIANS: For improved safety, the pedestrian intervals were reviewed and increased at most intersections based on current 2012 California MUTCD standards. Changes to pedestrian timing were made at 11 project intersections.



BENEFITS TO TRANSIT: To assess the impacts on transit, travel time runs on transit vehicles were conducted both before and after the new timings were implemented. The evaluation results, as shown in the table to the right, demonstrate that the project resulted in some speed and travel time savings.

Project Costs

Consultant Costs (Basic Services/Plans, Transit Travel Time Runs)	\$33,740
Other Project Costs (GPS Clocks, School Peak Timing, etc.)	\$8,645
Agency Staff Costs (Estimate)	\$7,150
Total Costs	\$49,535

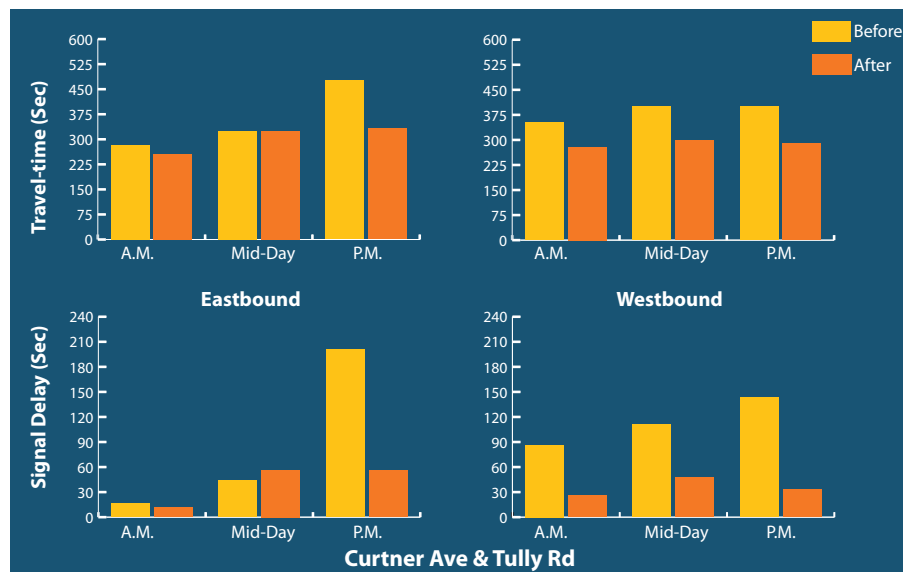
Project Benefits

Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	31,260 hrs.	\$596,679	156,300 hrs.	\$2,983,394
Fuel Consumption Savings	65,915 gal.	\$264,898	329,577 gal.	\$1,324,488
ROG Emissions Reduction	0.37 tons	\$465	1.85 tons	\$2,325
NOx Emissions Reduction	0.42 tons	\$7,555	2.10 tons	\$37,775
PM10 Emissions Reduction	0.08 tons	\$11,082	0.38 tons	\$55,409
CO Emissions Reduction	3.07 tons	\$238	15.37 tons	\$1,188
Total Lifetime Benefits				\$4,404,580
Transit Travel Time Savings	399 hrs.	\$7,616	1,995 hrs.	\$38,080
Total Lifetime Benefits with Transit				\$4,442,660

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	20%	3%
Average Speed Increase	26%	5%
Average Fuel Savings	17%	N/A
Average Reduction in Signal Delay	48%	N/A
Average Reduction in Number of Stops	50%	N/A

Overall Benefit-cost Ratio

90:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 48%

Average Reduction in Number of Stops: 50%

Auto Fuel Consumption

Savings: 17% or 329,577 gallons



Total Emissions Reduced (ROG, NOx, PM10, CO): 19.7 tons

Auto Travel Time Savings: 20% or 156,300 hours



Overall Project Benefit-cost Ratio = 90:1

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Project Consultant:

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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

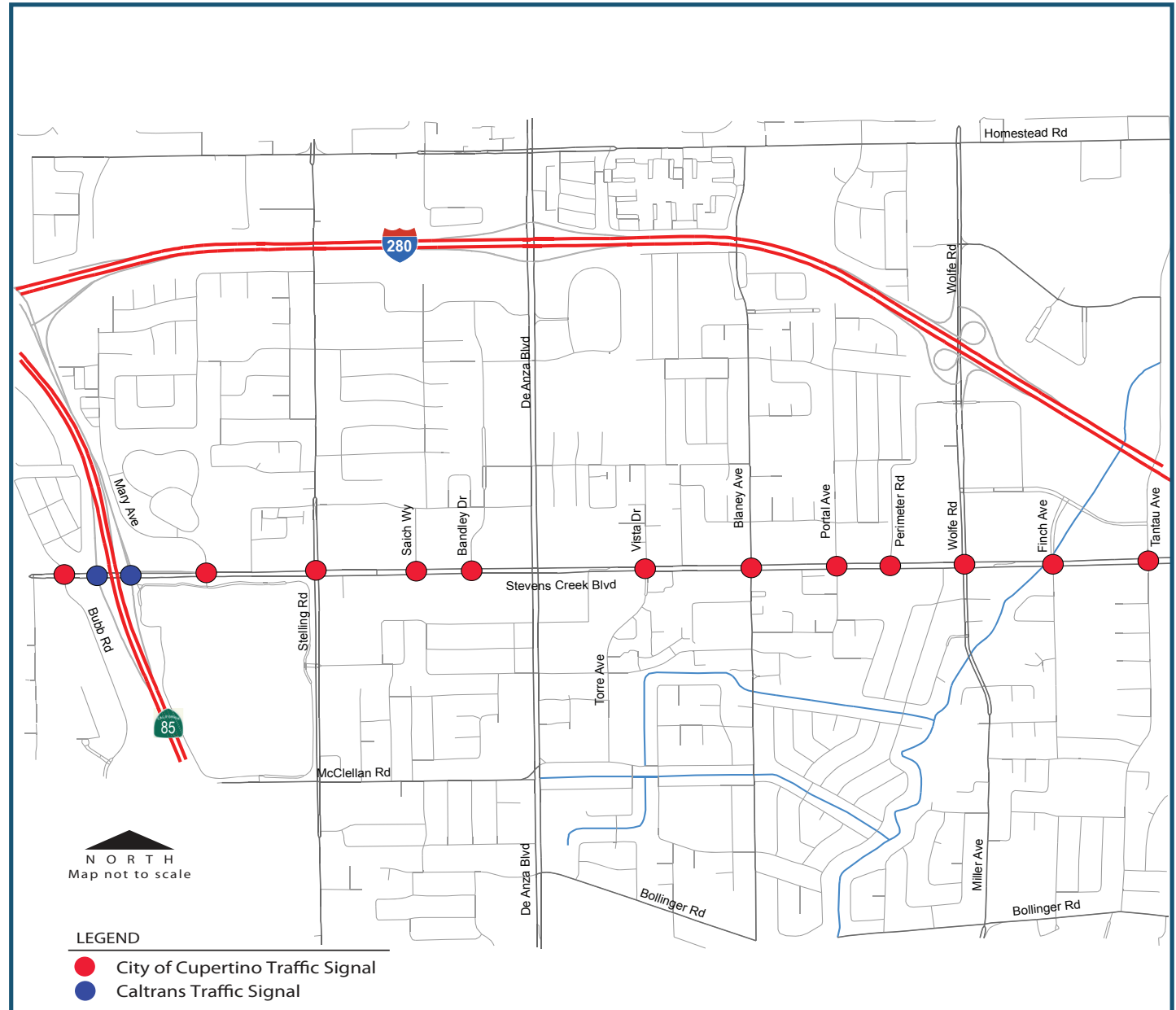
Stevens Creek Blvd ■ Traffic Signal Timing Project

City of Cupertino | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Cupertino received a Program for Arterial Synchronization (PASS) grant from the Metropolitan Transportation Commission to conduct a signal timing study for 14 signals along Stevens Creek Blvd between Bubb Rd/ Peninsula Ave and Tantau Ave.

The project objective was to develop traffic signal coordination timing plans for the weekday AM, midday, and PM peak periods, for all project signals, and school peak periods, for three of signals on the east end of the corridor. There was a concurrent Transit Performance Initiative (TPI) project that was being completed for VTA Line 323 Limited Service to provide transit signal priority (TSP) along this route within the project limits, therefore the PASS project was coordinated with the TPI project in development of the timings.



BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: For improved safety, the minimum green intervals were reviewed for bicyclists on the corridor.

Changes to minimum green intervals were made at five project intersections.



BENEFITS TO PEDESTRIANS: For improved safety, the pedestrian intervals were reviewed based on City

standards. Changes to pedestrian timing were made at two project intersections.



BENEFITS TO TRANSIT: Based on the transit travel time runs, the project resulted in an average of 7% increase in

speed and an average of 11% savings in travel time for the buses serving the corridor.

These results show that optimizing signal timings on a regular basis provides significant benefits to the users and transit operators.



BENEFITS TO TRAFFIC SAFETY: To enhance safety, the yellow clearance intervals were reviewed and updated based

on current standards. Changes to clearance intervals were made at five project intersections. After the new timing plans were implemented, the auto stops were reduced by 45%. Additional benefits from reduction in stops include reduced vehicle maintenance, and reduced driver frustration.

Project Costs

Consultant Costs(Weekday Peak Coordination Plans, Transit Travel Time Runs)	\$37,550
Other Project Costs (Additional ADT count, School Peak Timing)	\$5,025
Agency Staff Costs (Estimate)	\$8,225
Total Costs	\$50,800

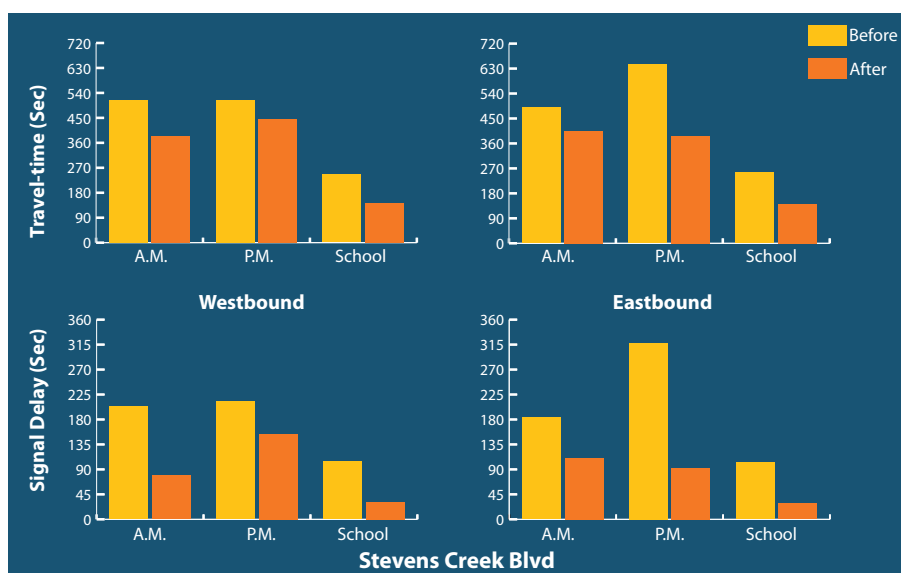
Project Benefits

Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	53,647 hrs.	\$1,024,002	268,237 hrs.	\$5,120,010
Fuel Consumption Savings	190,686 gal.	\$766,320	953,431 gal.	\$3,831,601
ROG Emissions Reduction	1.34 tons	\$1,690	6.71 tons	\$8,452
NOx Emissions Reduction	1.65 tons	\$29,665	8.24 tons	\$148,325
PM10 Emissions Reduction	0.26 tons	\$37,572	1.29 tons	\$187,861
CO Emissions Reduction	8.36 tons	\$646	41.79 tons	\$3,230
Total Lifetime Benefits				\$9,299,479
Transit Travel Time Savings	3,141 hrs.	\$59,953	15,705 hrs.	\$299,766
Total Lifetime Benefits with Transit				\$9,599,245

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	28%	11%
Average Speed Increase	42%	7%
Average Fuel Savings	23%	N/A
Average Reduction in Signal Delay	56%	N/A
Average Reduction in Number of Stops	45%	N/A

Overall Benefit-Cost Ratio

189:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 56%

Average Reduction in Number of Stops: 45%

Auto Fuel Consumption Savings: 23% or 953,461 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 58.03 tons

Auto Travel Time Savings: 28% or 268,237 hours



Average Travel Time Savings: 11% or 15,705 hours

Overall Project Benefit-cost Ratio = 189:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

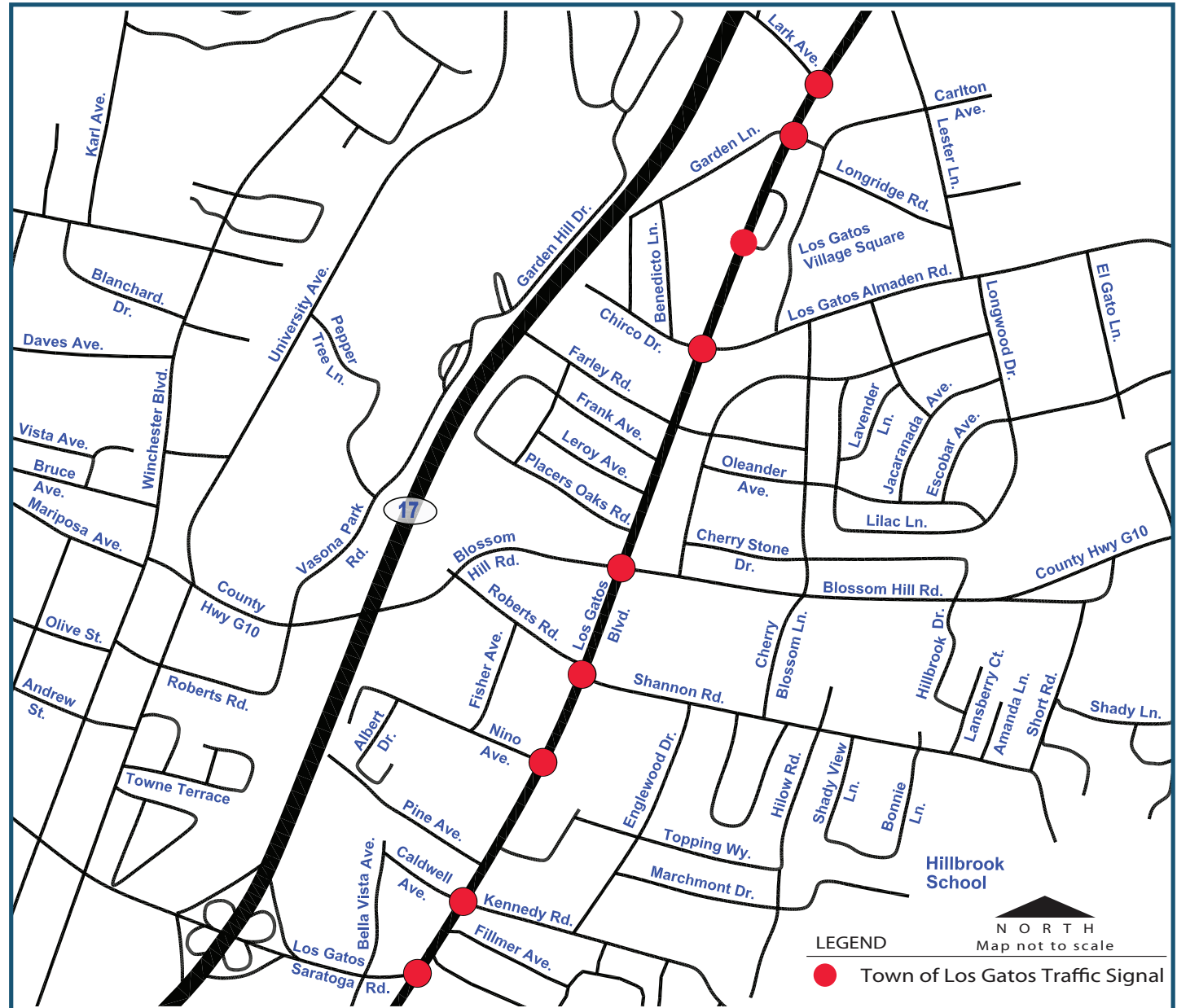
Los Gatos Blvd ■ Traffic Signal Timing Project

Town of Los Gatos | Metropolitan Transportation Commission

PROJECT OVERVIEW

The Town of Los Gatos received a Program for Arterial Synchronization (PASS) grant from the Metropolitan Transportation Commission to conduct a signal timing study for nine signals along Los Gatos Boulevard between Saratoga Road and Lark Avenue. The goal of this project was to facilitate traffic progression along Los Gatos Boulevard; and to update the signal timing plans to achieve operational efficiency of the traffic signals. The project objective was to develop traffic signal coordination timing plans for the AM, school PM, and PM peak periods.

These new timing plans effectively serve the heavy directional traffic of the corridor, which varies for the AM and the PM commute peak periods. Specifically, traffic congestion along Los Gatos Blvd between Saratoga Rd and Lark Ave has been reduced significantly. Other intrinsic benefits that were derived from investing in the project include minimizing motorists' frustration by reducing traffic congestion and delay.



...PROJECT OVERVIEW

This PASS project involved the completion of the following major tasks: collecting traffic volumes and turning movement counts -- including bike and pedestrian counts -- at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans.

BENEFITS TO VARIOUS MODES



BENEFITS TO PEDESTRIANS:

The Walk timing and Flash Don't Walk clearance timing parameters were updated to provide adequate time for children and seniors to safely cross the intersections, and to adhere to the 2012 CA MUTCD walking speed of 3.5 feet/second.



BENEFITS TO TRANSIT:

Based on the transit travel time runs, the project resulted in an average of 9% increase in speed and an average of 4%

savings in travel time for the buses serving the corridor. These results show that optimizing signal timings on a regular basis provides significant benefits to the users and transit operators.



BENEFITS TO TRAFFIC SAFETY:

To enhance traffic safety, the yellow clearance timing parameters were updated based on posted speed limits along the study corridor, and all red clearance timing parameters were reviewed.

Project Costs

Consultant Costs (Weekday Peak Coordination Plans)	\$27,900
Other Project Costs (Communication Equipment, etc.)	\$0
Agency Staff Costs (Estimate)	\$6,975
Total Costs	\$34,875

Project Benefits

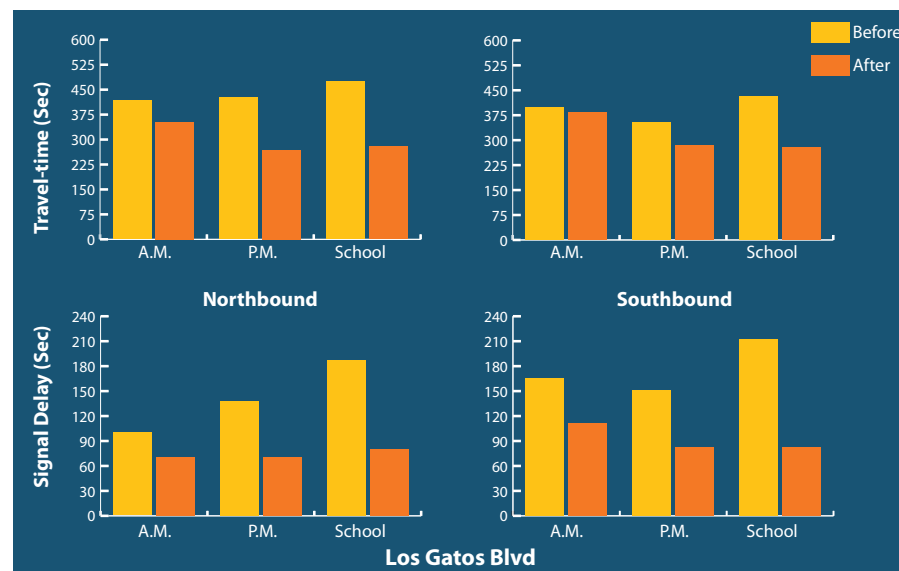
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	28,979 hrs.	\$553,147	144,896 hrs.	\$2,765,734
Fuel Consumption Savings	55,232 gal.	\$221,964	276,161 gal.	\$1,109,822
ROG Emissions Reduction	0.41 tons	\$520	2.06 tons	\$2,598
NOx Emissions Reduction	0.52 tons	\$9,313	2.59 tons	\$46,563
PM10 Emissions Reduction	0.08 tons	\$11,327	0.39 tons	\$56,635
CO Emissions Reduction	2.4 tons	\$186	12.01 tons	\$928
Total Lifetime Benefits				\$3,982,280

Transit Travel Time Savings	52 hrs.	\$988	259 hrs.	\$4,938
Total Lifetime Benefits with Transit				\$3,987,219

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	28%	4%
Average Speed Increase	42%	9%
Average Fuel Savings	22%	N/A
Average Reduction in Signal Delay	47%	N/A
Average Reduction in Number of Stops	45%	N/A

Overall Benefit-cost Ratio

114:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 47%

Average Reduction in Number of Stops: 45%

Auto Fuel Consumption Savings: 22% or 276,161 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 17.05 tons

Auto Travel Time Savings: 28% or 144,896 hours



Average Transit Travel Time Savings: 4% or 259 hours

Overall Project Benefit-cost Ratio = 114:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

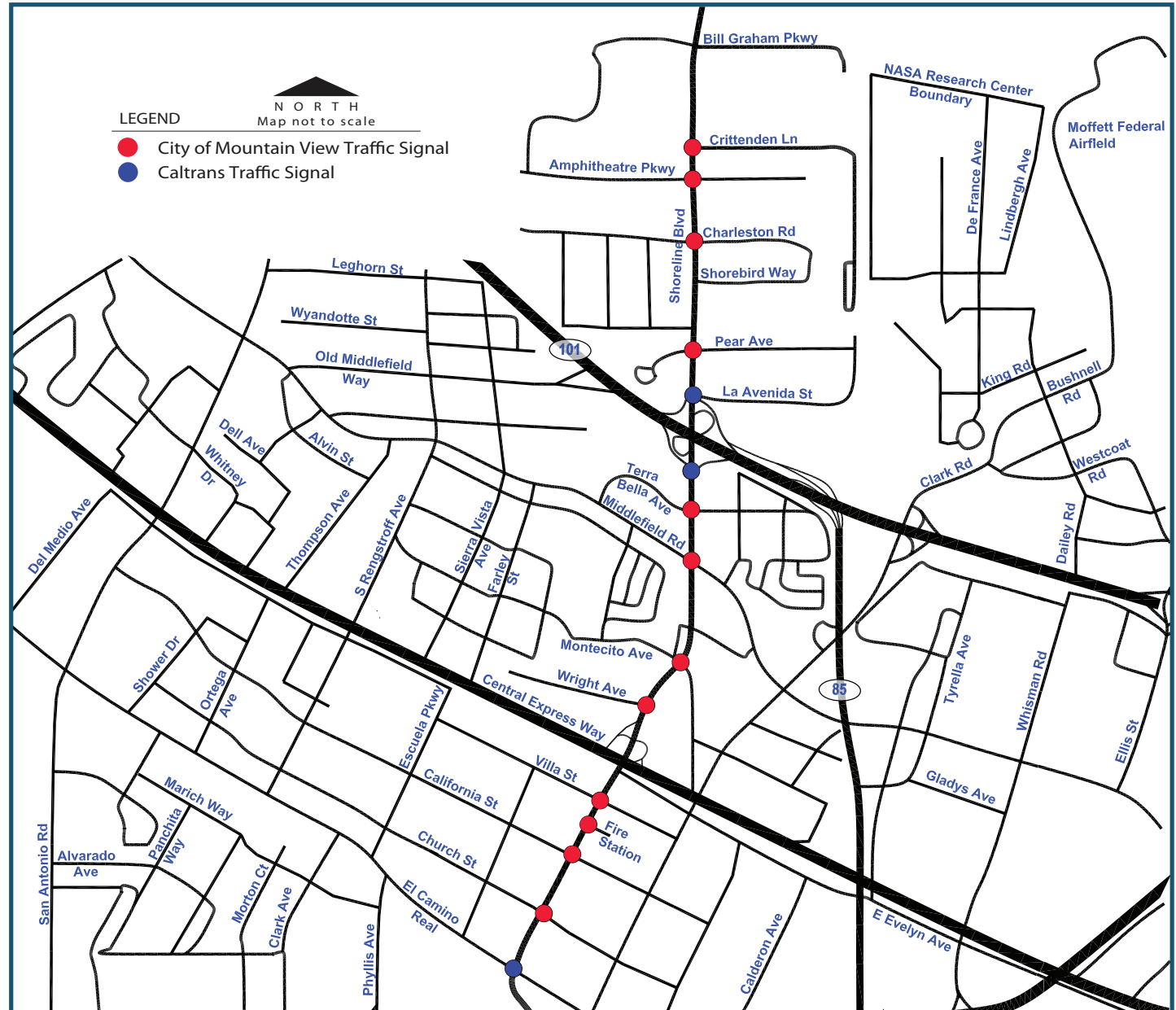
Shoreline Blvd ■ Traffic Signal Timing Project

City of Mountain View | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Mountain View, in conjunction with Caltrans, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to conduct a signal timing study for 15 signals along Shoreline Blvd between Crittenden Lane and El Camino Real. The project services include developing and implementing traffic signal coordination timing plans for the AM, midday and PM peak periods to facilitate traffic progression along Shoreline Blvd, and to improve the operational efficiency of the traffic signals with the existing capacity constraints.

At the request of the city, the PASS also completed these additional services: 1) evaluating the options to provide communication between the project signals and the city traffic operations center; 2) evaluating the removal of an exclusive left-turn on the northbound approach at the intersection of Shoreline Blvd and Pear Ave; and 3) evaluating the need for a dedicated right-turn lane for the eastbound approach of Charleston Rd at Shoreline Blvd, including providing concept level signing and striping layout.



OTHER RECOMMENDED IMPROVEMENTS

The following recommendations could be further studied to mitigate congestion along Shoreline Blvd: i) To provide a bus pull out area to serve as a passenger drop-off location north of Pear Ave along Shoreline Blvd; and ii) To relocate the current drop-off location north of Charleston Ave to a new location, to reduce backup past Charleston Rd and to reduce weaving within the intersection.

BENEFITS TO VARIOUS MODES



BENEFITS TO BICYCLISTS: The minimum green intervals were reviewed for bicyclists to improve the safety at the intersections based on 2012 California MUTCD standards. Changes to minimum green were made at the intersections not meeting the standard requirements.



BENEFITS TO PEDESTRIANS: The Walk timing and Flash Don't Walk clearance timing parameters were also updated to provide adequate time for children and seniors to safely cross the study intersections to accommodate the new walking speed of 3.5 feet/second.



BENEFITS TO TRANSIT: Based on the transit travel time runs, the project resulted in an average of 35% increase in speed and an average of 22% savings in transit travel time. These results show that optimizing signal timings on a regular basis provides significant benefits to the users and transit operators.

Project Costs

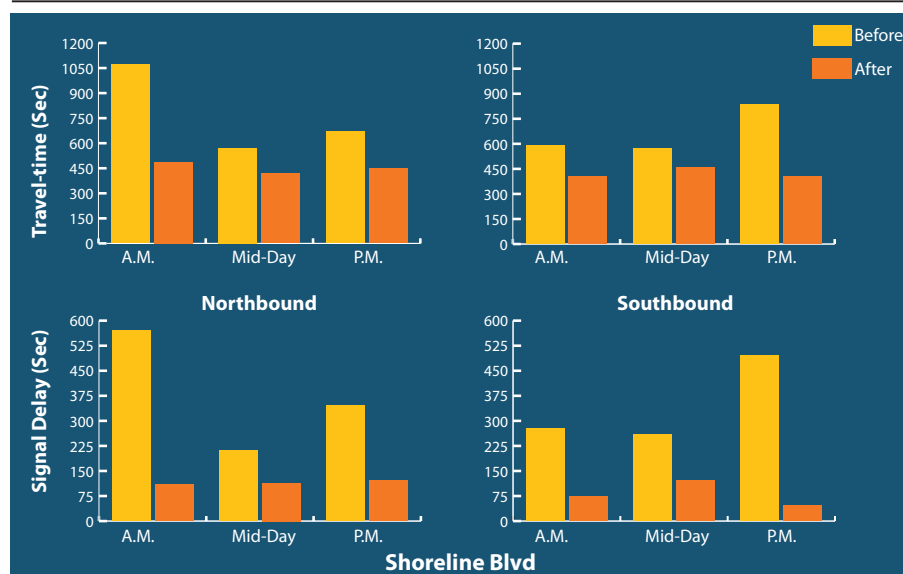
Consultant Costs (Basic Services/Plans)	\$38,250
Other Project Costs (GPS Clocks, Communications Equipment, etc.)	\$14,550
Agency Staff Costs (Estimate)	\$9,563
Total Costs	\$62,363

Project Benefits

Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	55,725 hrs.	\$1,063,665	278,627 hrs.	\$5,318,327
Fuel Consumption Savings	106,331 gal.	\$427,318	531,655 gal.	\$2,136,588
ROG Emissions Reduction	0.89 tons	\$1,114	4.43 tons	\$5,570
NOx Emissions Reduction	1.17 tons	\$21,111	5.87 tons	\$105,554
PM10 Emissions Reduction	0.16 tons	\$23,071	0.79 tons	\$115,354
CO Emissions Reduction	4.53 tons	\$350	22.65 tons	\$1,750
Total Lifetime Benefits				\$7,683,143
Transit Travel Time Savings	286 hrs.	\$5,456	1,429 hrs.	\$27,279
Total Lifetime Benefits with Transit				\$7,710,422

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	40%	22%
Average Speed Increase	62%	35%
Average Fuel Savings	32%	N/A
Average Reduction in Signal Delay	72%	N/A
Average Reduction in Number of Stops	69%	N/A

Overall Benefit-cost Ratio 124:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 72%

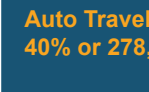
Average Reduction in Number of Stops: 69%



Auto Fuel Consumption Savings: 32% or 531,655 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 33.74 tons



Auto Travel Time Savings: 40% or 278,627 hours



Average Transit Travel Time Savings: 22% or 1,429 hours

Overall Project Benefit-cost Ratio = 124:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

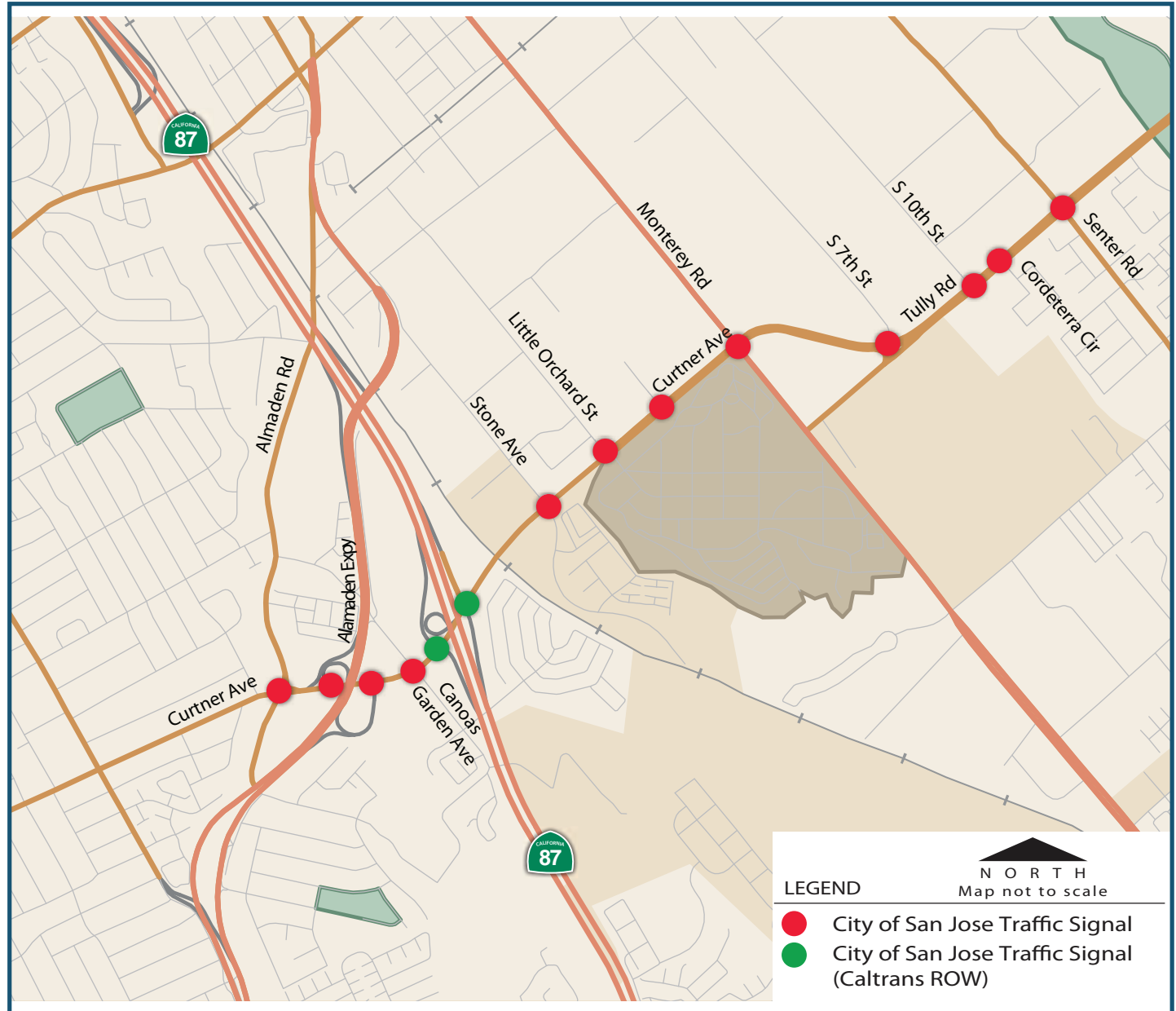
Curtner Ave/Tully Rd ■ Traffic Signal Timing Project

City of San Jose | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of San Jose received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission (MTC) to conduct a signal timing study for 14 signals along Curtner Ave/Tully Rd between Almaden Rd and Senter Rd. The goal of the project was to develop and implement signal coordination during the Weekend AM and PM peak periods. This east-west arterial provides access to the Almaden Expressway and SR 87 near the west end, the Fairgrounds on the east end, and commercial and shopping centers, including the 650,000 square-foot Plant Shopping Center.

This PASS project involved the completion of the following major tasks: collecting traffic volumes and turning movement counts -- including bike and pedestrian counts -- at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans.



...PROJECT OVERVIEW

During all Saturday peak periods, there was a decrease in average travel time, delay, and stops in both directions. Field fine-tuning consisted of driving the corridors and standing at critical intersections to review traffic progression and intersection operations. Minor adjustments to offsets and splits were made during fine-tuning to further improve traffic progression along the corridors and to optimize intersection operations.

BENEFITS TO VARIOUS MODES



BENEFITS TO PEDESTRIANS:

The minimum pedestrian clearance time was reviewed and updated at all project intersections to provide enhanced safety for the pedestrians in accordance to the 2012 California MUTCD standards.



BENEFITS TO TRANSIT:

To assess the impacts on transit, travel time runs on transit vehicles were conducted both before and after the new timings were implemented. These evaluation results, as shown in the table to the right, demonstrate that the project provides significant benefits to transit.



BENEFITS TO TRAFFIC SAFETY:

The project updated the yellow clearance intervals according to the current standards.

Project Costs

Consultant Costs (Weekday Peak Coordination Plans, Transit Travel Time)	\$36,870
Other Project Costs (GPS Clocks, Communications Equipment, etc.)	\$0
Agency Staff Costs (Estimate)	\$8,225
Total Costs	\$45,095

Project Benefits

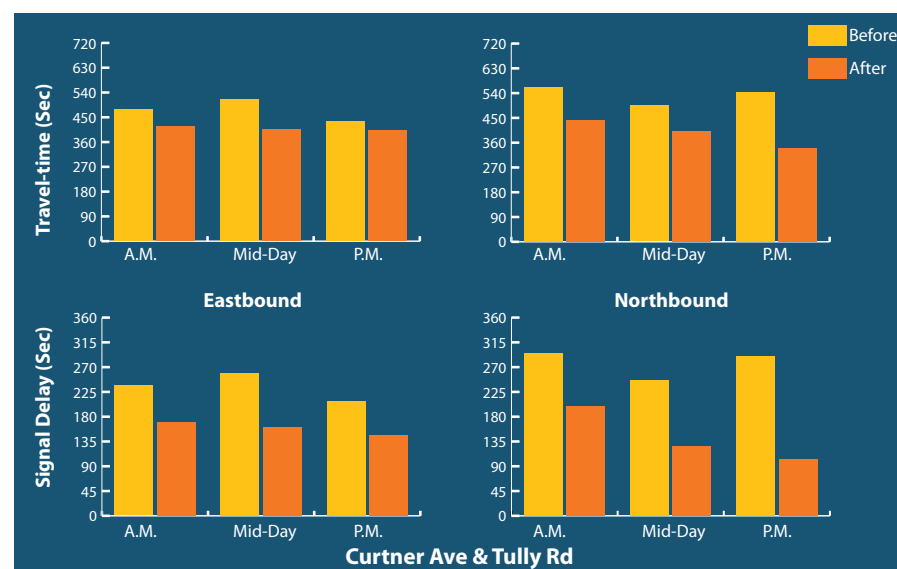
Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	10,637 hrs.	\$203,030	53,184 hrs.	\$1,015,152
Fuel Consumption Savings	31,146 gal.	\$125,167	155,729 gal.	\$625,837
ROG Emissions Reduction	0.24 tons	\$307	1.22 tons	\$1,534
NOx Emissions Reduction	0.31 tons	\$5,524	1.53 tons	\$27,620
PM10 Emissions Reduction	0.05 tons	\$6,636	0.23 tons	\$33,179
CO Emissions Reduction	1.35 tons	\$104	6.75 tons	\$522
Total Lifetime Benefits				\$1,703,844

Transit Travel Time Savings	321 hrs.	\$6,135.45	1,607 hrs.	\$30,677
Total Lifetime Benefits with Transit				\$1,734,521

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	20%	10%
Average Speed Increase	25%	6%
Average Fuel Savings	15%	N/A
Average Reduction in Signal Delay	41%	N/A
Average Reduction in Number of Stops	44%	N/A

Overall Benefit-cost Ratio

38:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 41%

Average Reduction in Number of Stops: 44%

Auto Fuel Consumption Savings: 15% or 155,729 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 9.73 tons

Auto Travel Time Savings: 20% or 53,184 hours



Average Transit Travel Time Savings: 10% or 1,607 hours

Overall Project Benefit-cost Ratio = 38:1



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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

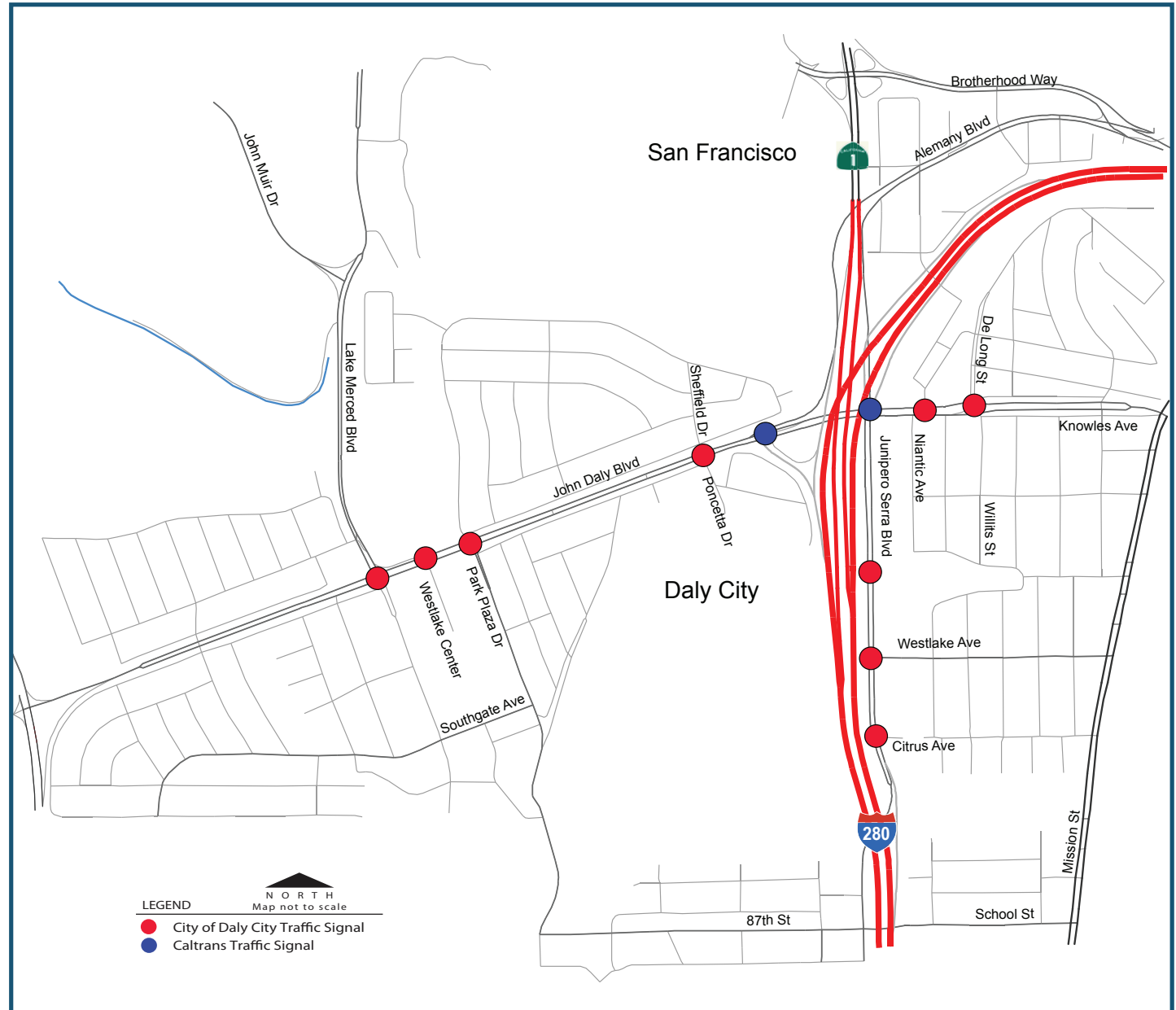
John Daly/Junipero Serra Blvd ■ Traffic Signal Timing Project

City of Daly City | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Daly City, in conjunction with Caltrans, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to develop and implement optimized signal coordination timing plans for 11 signals along John Daly Blvd and Junipero Serra Blvd. The project objective was to develop traffic signal coordination timing plans for the weekday AM, midday, and PM peak periods for all project signals and weekend peak periods for six of the project signals.

The goal of this project was to facilitate traffic progression along the corridors, and achieve operational efficiency of the traffic signals with the existing capacity constraints. Attaining this goal is expected to mitigate congestion, reduce harmful greenhouse gas emissions, reduce travel time, and improve traffic safety.



...PROJECT OVERVIEW

This PASS project involved the completion of the following major tasks: collecting traffic volumes and turning movement counts, including bike and pedestrian counts, at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans.

GPS SIGNAL COMMUNICATIONS

To provide a common time-source and enable communication between the City and Caltrans signals cost-effectively, GPS devices were installed at two project intersections. These devices enable the signal controllers to regularly synchronize their clocks; efficiently deploy the timing plans at the same time; and thus help maintain the efficiency of signal coordination. They are installed at the city signal at John Daly Blvd & DeLong St, and the Caltrans signal at John Daly Blvd & Southbound I-280 Ramp intersections.



BENEFITS TO PEDESTRIANS:

For improved safety, the pedestrian intervals were reviewed and increased at most intersections based on current 2012 California MUTCD standards. Changes to pedestrian timing were made at nine project intersections.

Project Costs

Consultant Costs (Weekday Peak Coordination Plans)	\$26,650
Consultant Costs (Transit Travel Time Runs, Weekend Timing)	\$17,490
Agency Staff Costs (Estimate)	\$6,663
Total Costs	\$50,803

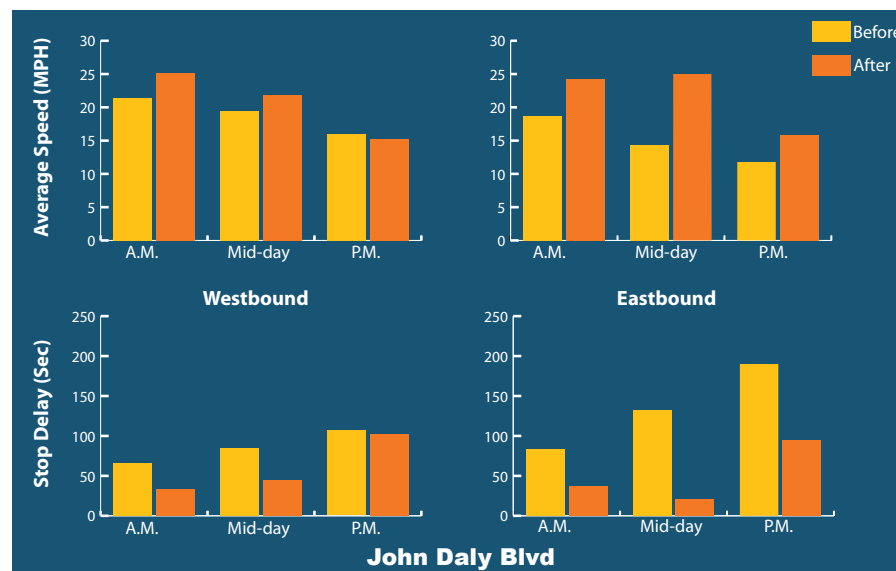
Project Benefits

Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	13,200 hrs.	\$251,963	66,002 hrs.	\$1,259,814
Fuel Consumption Savings	45,045 gal.	\$181,024	225,225 gal.	\$905,122
ROG Emissions Reduction	0.36 tons	\$447	1.78 tons	\$2,237
NOx Emissions Reduction	0.47 tons	\$8,393	2.33 tons	\$41,963
PM10 Emissions Reduction	0.06 tons	\$9,388	0.32 tons	\$46,941
CO Emissions Reduction	1.95 tons	\$151	9.77 tons	\$755
Total Lifetime Benefits				\$2,256,831
Transit Travel Time Savings	69 hrs.	\$1,311	343 hrs.	\$6,554
Total Lifetime Benefits with Transit				\$2,263,385

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	16%	0%
Average Speed Increase	18%	1%
Average Fuel Savings	12%	N/A
Average Reduction in Signal Delay	42%	N/A
Average Reduction in Number of Stops	37%	N/A

Overall Benefit-Cost Ratio

45:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 42%

Average Reduction in Number of Stops: 37%

Auto Fuel Consumption Savings: 12% or 225,225 gallons



Total Emissions Reduced (ROG, NOx, PM10, CO): 14.2 tons

Auto Travel Time Savings: 16% or 66,000 hours



Overall Project Benefit-cost Ratio = 45:1

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PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS) FY12/13 CYCLE

Marsh Rd/Middlefield Rd/Sand Hill Rd

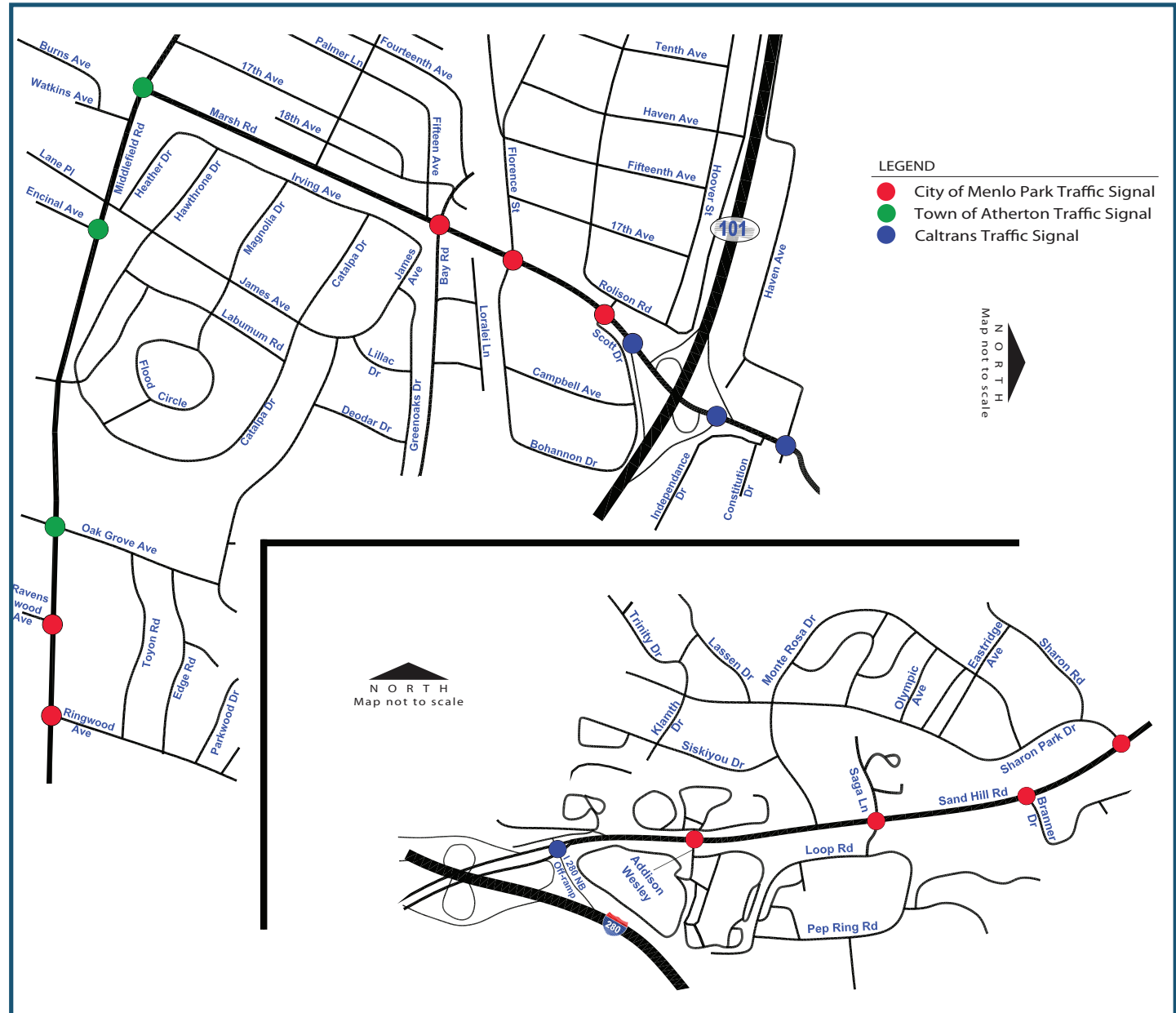
City of Menlo Park | Town of Atherton | Caltrans | Metropolitan Transportation Commission

PROJECT OVERVIEW

The City of Menlo Park, in conjunction with Caltrans and Town of Atherton, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission to conduct a signal timing study for 16 signals along Marsh Rd, Middlefield Rd and Sand Hill Rd.

The project services include developing and implementing traffic signal coordination timing plans for the AM and PM peak periods for all project intersections and an additional midday peak period plan for five intersections along Sand Hill Road.

This PASS project involved the completion of the following major tasks: collecting traffic volumes and turning movement counts -- including bike and pedestrian counts -- at all project intersections; analyzing this traffic data including collision data to develop optimized signal timing plans; implementing and fine-tuning the plans in the field; and conducting travel time surveys to analyze the performance of the new timing plans.



...PROJECT OVERVIEW

The implementation of the new timing plans resulted in significant improvements in traffic operations at the intersection of US 101 Southbound Ramps/Marsh Rd. They also reduced queuing at the off-ramp during the PM peak period. To resolve implementation issues towards the end of the project, the PASS also helped in upgrading the existing firmware at Sand Hill Rd/Branner Dr and Sand Hill Rd/Sharon Park Dr intersections.

BENEFITS TO VARIOUS MODES

BENEFITS TO PEDESTRIANS:



The Walk timing and Flash Don't Walk clearance timing parameters were also updated to provide adequate time for children and seniors to safely cross the study intersections to accommodate the new walking speed of 3.5 feet/second.



BENEFITS TO TRANSIT: Based on the transit travel time runs, the project resulted in an average of 9% increase in speed and an average of 5% savings in transit travel time.



BENEFITS TO TRAFFIC SAFETY:

To enhance traffic safety, the yellow clearance timing parameters were updated based on posted speed limits along the study corridor.

Project Costs

Consultant Costs (Basic Services, Additional Plans)	\$45,415
Other Project Costs (GPS Clocks, Communications Equipment, etc.)	\$4,044
Agency Staff Costs (Estimate)	\$1,154
Total Costs	\$50,613

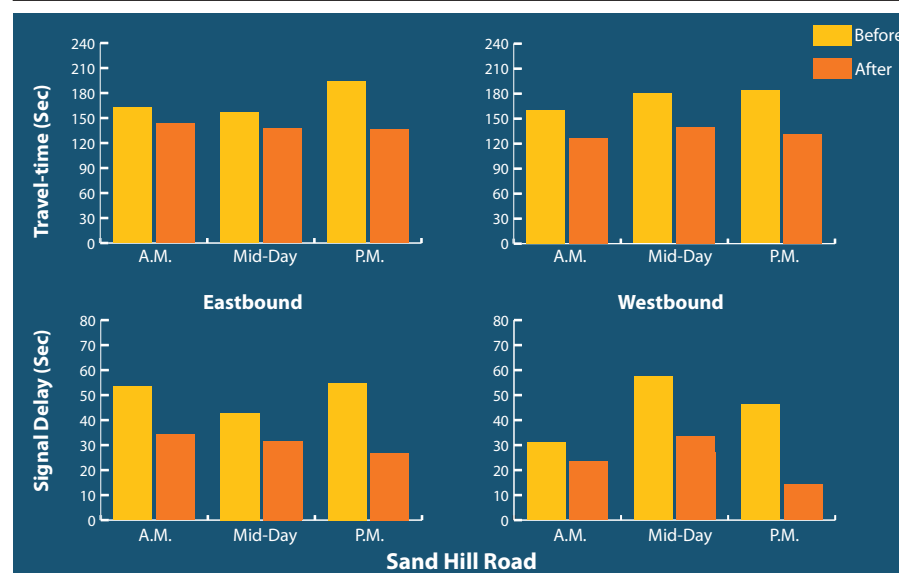
Project Benefits

Measures	Annual Average		Lifetime (5 Years)	
	Savings	Monetized Savings	Savings	Monetized Savings
Travel Time Savings	19,176 hrs.	\$366,023	95,879 hrs.	\$1,830,114
Fuel Consumption Savings	39,253 gal.	\$157,746	196,263 gal.	\$788,732
ROG Emissions Reduction	0.34 tons	\$423	1.68 tons	\$2,116
NOx Emissions Reduction	0.45 tons	\$8,101	2.25 tons	\$40,506
PM10 Emissions Reduction	0.06 tons	\$8,577	0.29 tons	\$42,884
CO Emissions Reduction	1.69 tons	\$131	8.47 tons	\$654
Total Lifetime Benefits				\$2,705,006

Transit Travel Time Savings	151 hrs.	\$2,880	754 hrs.	\$14,401
Total Lifetime Benefits with Transit				\$2,719,407

Overall Project Benefits	Auto	Transit
Average Decrease in Travel Time	22%	5%
Average Speed Increase	26%	9%
Average Fuel Savings	16%	N/A
Average Reduction in Signal Delay	51%	N/A
Average Reduction in Number of Stops	49%	N/A

Overall Benefit-cost Ratio 59:1



PROJECT BENEFITS SUMMARY



Average Reduction in Auto Signal Delay: 51%

Average Reduction in Number of Stops: 49%

Auto Fuel Consumption Savings: 16% or 196,263 gallons



Total Emissions Reduced (ROG, Nox, PM10, CO): 12.69 tons

Auto Travel Time Savings: 22% or 95,879 hours



Average Transit Travel Time Savings: 5% or 754 hours

Overall Project Benefit-cost Ratio = 59:1



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CITY OF DALY CITY

CITY OF DUBLIN

CITY OF EMERYVILLE

CITY OF FOSTER CITY

CITY OF FREMONT

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